MORISON SUSPENSION FURNACES

FOR INTERNAL FURNACE BOILERS

THE CONTINENTAL IRON WORKS
· NEW YORK ·
BOROUGH OF BROOKLYN.

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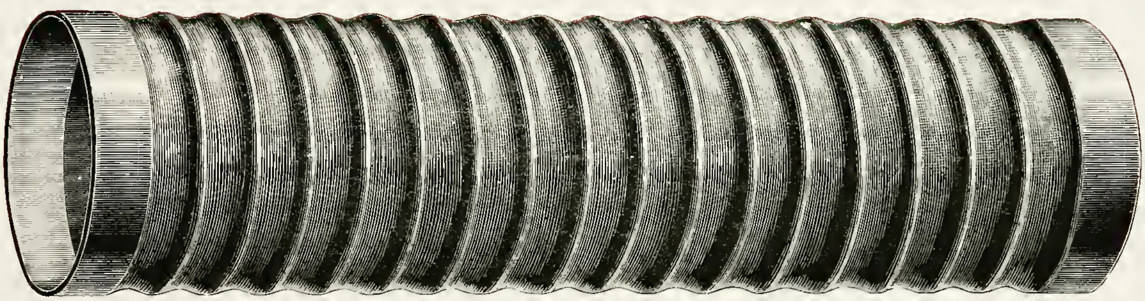
MORISON SUSPENSION FURNACES



FURNACE FRONTS AND DOORS

FOR

INTERNAL FURNACE TUBULAR BOILERS.

MANUFACTURED IN THE

UNITED STATES

SOLELY BY

THE CONTINENTAL IRON WORKS,

NEW YORK, N. Y.

(BOROUGH OF BROOKLYN.)

1898.

MORISON SUSPENSION FURNACES

FOR INTERNAL FURNACE TUBULAR BOILERS.

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THE CONTINENTAL IRON WORKS,

NEW YORK.

(BOROUGH OF BROOKLYN.)

FURNACES FOR BOILERS OF CHICAGO CITY WATER WORKS,
CHICAGO, ILL.

Internal Furnace Tubular Boilers,

WITH

MORISON SUSPENSION FURNACES.

IN presenting to the attention of Boiler Designers, Boiler Builders, and the Engineering Profession in general, designs of INTERNAL FURNACE TUBULAR BOILERS, it is the desire of THE CONTINENTAL IRON WORKS, to promote the adoption of boilers of this type, for stationary purposes.

The introduction of Electric Light Plants, Central Power Stations, for either electric or cable traction, Water Works Pumping Stations, and for other purposes, where large boiler powers are necessary, makes it desirable to secure the most economical results in regard to their efficiency, and economy of space occupied by them. In Public Buildings, Office Buildings, Hotels, etc., the space devoted to the steam plant is usually in the cellar, and generally of quite limited dimensions, causing the choice of the proper type of boiler, which will best comply therewith, to become a question of prime importance.

THE HORIZONTAL TUBULAR BOILER, with Furnace Grate beneath the shell, has heretofore been most in favor, and very generally adopted for Stationary Boiler service, particularly where ordinary steam pressures, not exceeding one hundred pounds per square inch, have been sufficient; but the increasing demand for much higher steam pressures, has brought into vogue other types of Steam Generators, notably the various designs of Water Tube Boilers, all of which are subject to the same character of defects, as are incident to every type of boiler, which is set in surrounding walls of brick, between which walls, the furnace is contained. These defects, generally consisting of the cracking of the walls, due to unequal heating and cooling, and consequent expansion and contraction, permit very considerable loss of heat through the interstices, which, together with the radiation from the mass of brick work, becomes a serious detriment to effective Boiler duty.

The volume of water contained in all Water Tube Boilers, is relatively small, and necessarily affords but a limited reservoir for the storage of heat, the effect of which, is frequent and rapid fluctuations in steam pressure, unless the "feeding" and the "firing" of the boiler are exceedingly regular.

INTERNAL FURNACE BOILERS contain relatively greater volumes of water, which act as reservoirs of heat, to be used as occasion demands, and aids in keeping the steam at constantly uniform pressures, which is a feature of vital importance.

In locations where "hard" or "contaminated" water must be used, accumulations of mud and scale adhere to the inside surface of the tubes and headers of Water Tube Boilers, which it is

practically impossible to remove, the effect of which is to shorten the life of such boilers, and eventually making them untrustworthy and probably dangerous.

In boilers of the Internal Furnace type, it is practicable, by means of the Manhole and several Handholes, to remove all deposits and accumulations, and give the interior of the Boiler proper care.

In marine practice, the "Scotch Boiler" has been found to fill all requirements in an eminent degree, and it is to a similar type of INTERNAL FURNACE BOILER, slightly modified in its back connections, without detriment to its characteristics, to which attention is requested.

Referring to the drawings, it will be observed that the type of INTERNAL FURNACE BOILER presented, consists of a horizontal cylindrical shell, having an internal suspension, or corrugated Furnace, within the front portion of which, the fire grate is located, the other portion, or end of the furnace, terminating in a back connection, or combustion chamber, consisting of a "fire brick lined" metallic casing, forming in effect, an extension of the boiler shell.

The products of combustion pass from this chamber, through the horizontal tubes, and are delivered into a sheet iron breeching, attached to the front head of the boiler.

This breeching may be connected directly with a smoke stack, or in the case of a battery of boilers, it may be attached to an uptake leading to a common chimney.

Several modifications of INTERNAL FURNACE TUBULAR BOILERS may be made. For example: Boilers may be arranged to contain two or more comparatively short furnaces, terminating in a common combustion chamber, from which, tubes lead directly to a smoke connection at the rear of the boiler, without returning forward over the furnaces, thus forming the well known "Locomotive" Type. Boilers of this latter type are used in several Gun Boats, and third-rate Cruisers of The United States Navy, also by numerous Water Works corporations, and are highly esteemed.

INTERNAL FURNACE BOILERS are economical in first cost, because of being "self contained;" that is, they are independent of masonry setting, cast iron fronts, buckstays, tie rods, etc., requiring but little foundation preparations, and are susceptible of being easily removed from one location to another with but little expense.

They are economical in the consumption of coal, from the fact that the furnaces being surrounded by water, the heat of combustion is utilized to a greater extent than is practicable with boilers having external furnaces contained within brick wall settings.

Morison Suspension Furnace.

This type of furnace (designed and patented by Mr. Donald B. Morison, of West Hartlepool, England) is the result of a series of exhaustive experiments which were conducted at Leeds, England, under the auspices of Mr. Samson Fox, the original introducer and promoter of the world renowned FOX CORRUGATED FURNACE. So indispensable has the latter type of furnace become, that more of them are in constant use than the aggregate of all other types of horizontal cylindrical furnaces.


MORISON SUSPENSION
FURNACES
FOR
INTERNAL FURNACE BOILERS.
THE CONTINENTAL IRON WORKS
OCT. 6, 1896. BROOKLYN, N.Y.

The advent of the Fox invention, wonderfully advanced the standard of boiler design and construction, and early commanded the highest consideration of all Boiler Designers, Builders and Users, steadily maintaining its distinction until the appearance of the MORISON SUSPENSION FURNACE, which at once assumed equal rank. These two designs are still unrivalled notwithstanding the fact that, during the last decade, numerous attempts have been made to produce some type of Boiler Furnace, which would vie with, and share in their established reputation.

The MORISON SUSPENSION FURNACE inherits, in pronounced development, all of the well known features, which have so firmly established the reputation of the FOX CORRUGATED FURNACE. The catenary form of curve in the MORISON SUSPENSION FURNACE, the distance between the centers of ridges of support, together with the general proportions as finally adopted, were experimentally and practically determined, and have proved to offer the greatest resistance to distortion or collapse, presenting a heating surface, which offers the minimum facility for lodgment of scale, and maximum convenience for readily removing the same when formed.

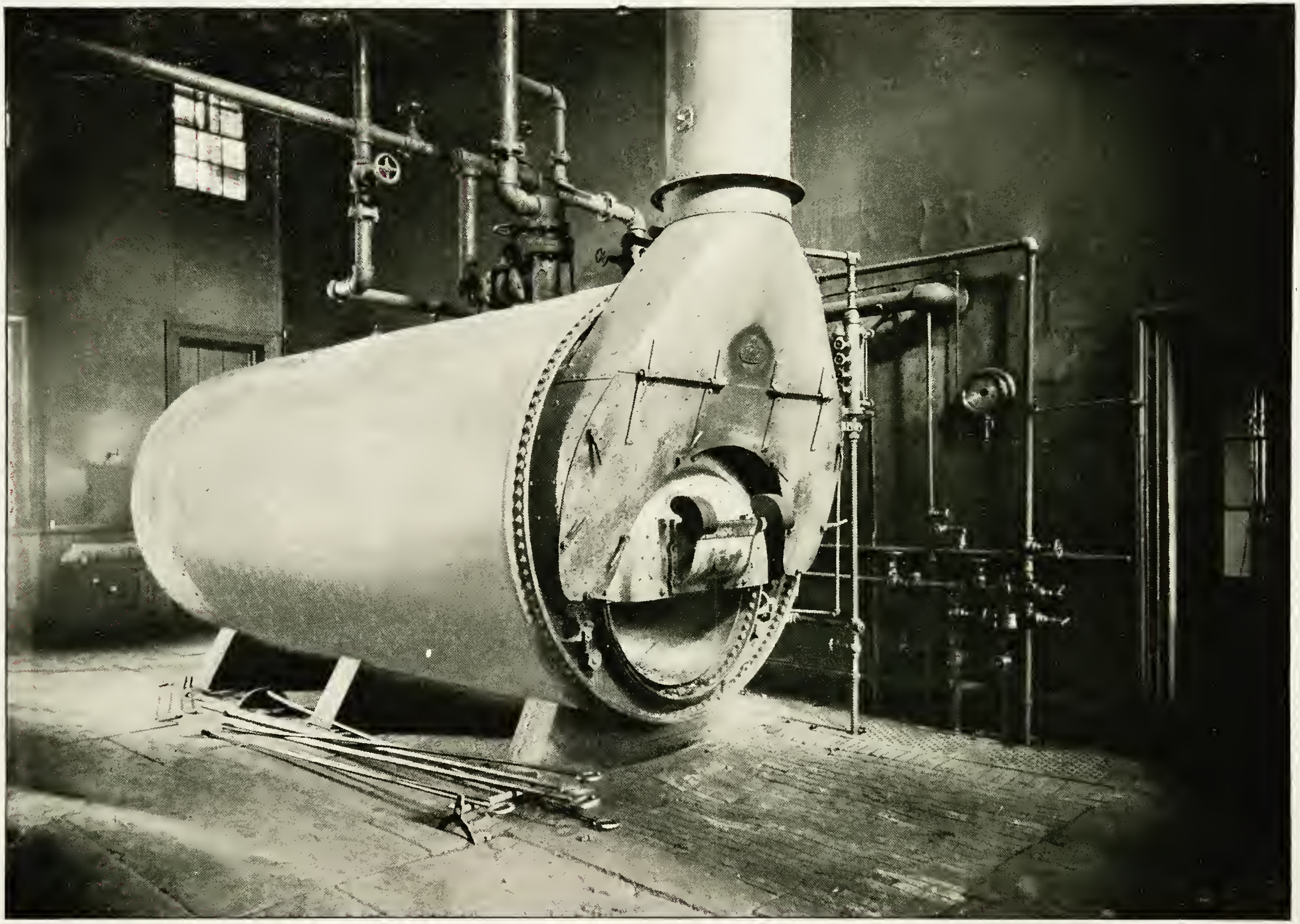
The MORISON SUSPENSION FURNACE is free from liability to crack and become distorted, accidents so incident to a type of cylindrical furnaces, which are reinforced with thick ribs rolled thereon ; also from the leakage, incident to all types of furnaces, which consist of sectional flanged and riveted cylinders, with reinforcing rings interposed between the flanges.

The freedom of the MORISON SUSPENSION FURNACE from these adverse and destructive features, has caused its adoption in numerous instances, to replace derelict furnaces of other designs, which, because of the above described troublesome characteristics, have made their substitution a necessity.

MORISON SUSPENSION FURNACES are made of the very best material, of specified chemical and physical characteristics, which, together with the first-class workmanship necessarily required for their production, insures perfection in the completed product.

An important feature of commercial interest is the fact that either type of furnace, namely, MORISON SUSPENSION, or FOX CORRUGATED, of equal dimensions and requirements, may be purchased at the same prices.

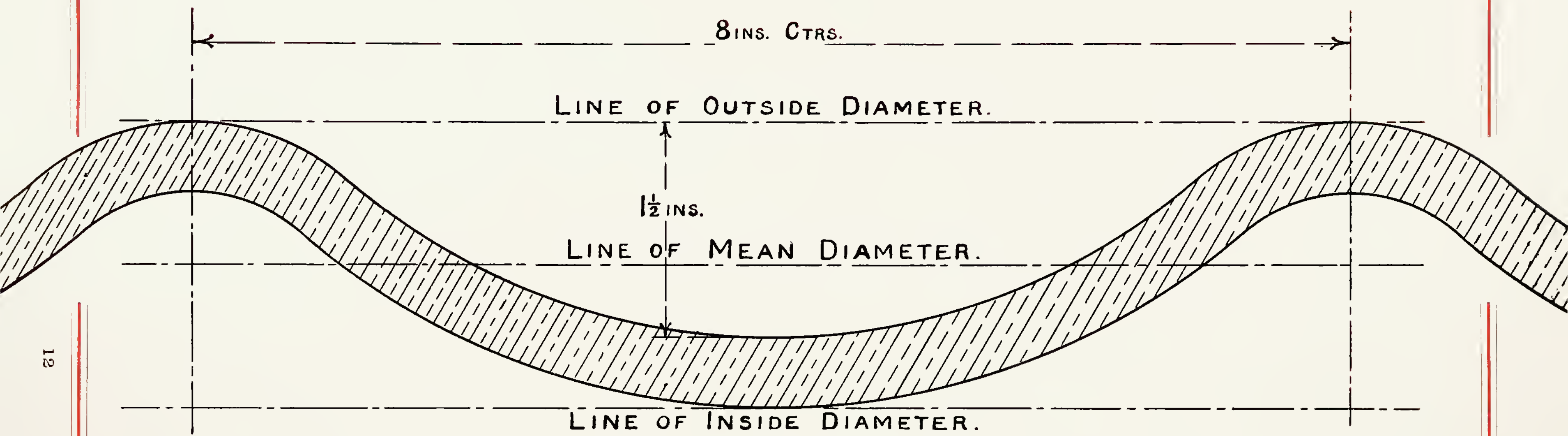
The sole right to manufacture and sell the MORISON SUSPENSION FURNACE and the FOX CORRUGATED FURNACE, within the United States and Canada, is the property of THE CONTINENTAL IRON WORKS of NEW YORK, BOROUGH OF BROOKLYN.



INTERNAL FURNACE BOILER AT 18th STREET STATION,
CONSOLIDATED GAS COMPANY, NEW YORK.

FULL SIZE DETAIL

OF



Morison Suspension Furnace

(FOX-MORISON PATENTS).

MANUFACTURED BY **The Continental Iron Works,**

NEW YORK.

(BOROUGH OF BROOKLYN.)

The Following Rule for Calculating the Thickness of Metal for Morison Suspension Furnaces,

when the inside diameters and working pressures are known, is that adopted by the Board of U. S. Supervising Inspectors of Steam Vessels, and should be followed in all cases.

$$T = \frac{P \times D}{14000}$$

T = Thickness of furnace in inches
P = Working pressure in pounds per square inch.
D = Mean diameter of furnace in inches = inside diameter + thickness of metal + $1\frac{1}{2}$.
14000 = a Constant.

EXAMPLE:—Given, a furnace 40 inches mean diameter, to carry a steam pressure of 175 pounds. Required; the thickness of metal necessary.

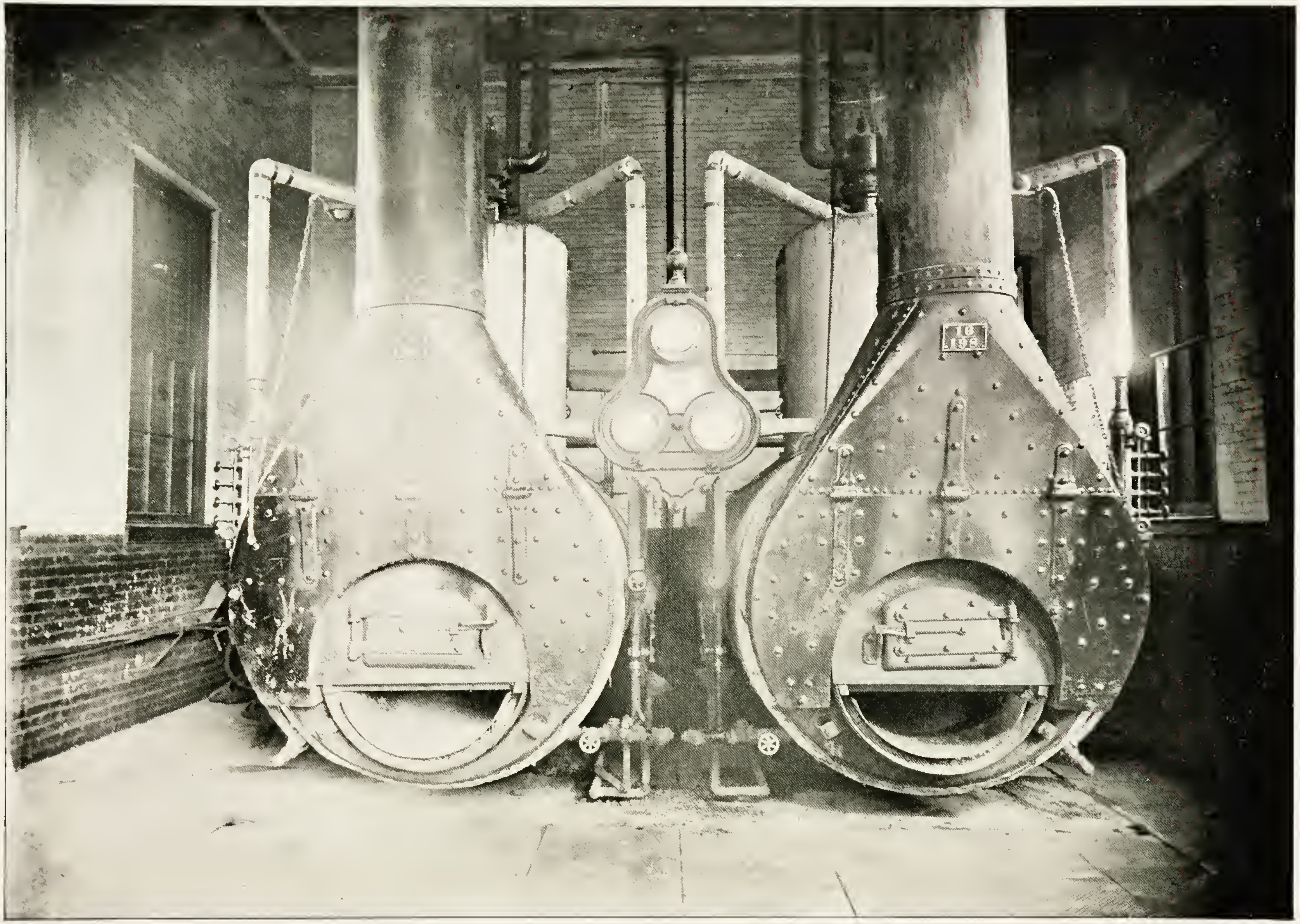
$$T = \frac{175 \times 40}{14000} = \frac{1}{2} \text{ inch.}$$

EXAMPLE:—Given, a furnace 40 inches mean diameter, ½ inch thick. Required; the steam pressure allowable. By transposing the above rule, we have

$$P = \frac{14000}{D} \times T \qquad \text{Hence, } P = \frac{14000}{40} \times \frac{1}{2} = 175 \text{ pounds.}$$

Table Showing Working Pressure and Thickness of Morison Suspension Furnaces.

Inside Diameter of Furnace.	WORKING PRESSURE IN POUNDS PER SQUARE INCH.														
	THICKNESS OF FURNACE.														
	$\frac{5}{16}$ in.	$\frac{11}{32}$ in.	$\frac{3}{8}$ in.	$\frac{13}{32}$ in.	$\frac{7}{16}$ in.	$\frac{15}{32}$ in.	$\frac{1}{2}$ in.	$\frac{17}{32}$ in.	$\frac{9}{16}$ in.	$\frac{19}{32}$ in.	$\frac{5}{8}$ in.	$\frac{21}{32}$ in.	$\frac{11}{16}$ in.	$\frac{23}{32}$ in.	$\frac{3}{4}$ in.
2 ft. 4 in.	146	160	175	189	204	219	233	247	262	276	290	304	318	332	347
2 5	142	156	170	183	197	212	225	239	253	267	281	294	308	322	336
2 6	137	151	164	178	191	205	218	232	245	259	272	285	299	312	325
2 7	133	146	159	172	186	199	212	225	238	251	264	277	290	302	315
2 8	129	142	154	166	180	193	205	218	231	243	256	268	281	294	306
2 9	125	138	150	162	175	187	200	212	224	236	249	261	273	285	297
2 10	122	134	146	158	170	182	194	206	218	230	242	254	265	277	289
2 11	119	130	142	154	165	177	189	200	212	224	235	247	258	270	281
3 0	115	127	138	149	161	172	184	195	207	218	229	240	252	263	274
3 1	112	123	135	146	157	168	179	190	201	212	223	234	245	256	267
3 2	110	120	131	142	153	164	175	185	196	207	218	228	239	250	260
3 3	107	117	128	138	149	160	170	181	191	202	212	223	233	244	254
3 4	104	115	125	135	146	156	166	176	187	197	207	217	228	238	248
3 5	102	112	122	132	142	152	162	172	183	192	202	212	222	232	242
3 6	100	109	119	129	139	149	159	168	178	188	198	207	217	227	237
3 7	97	107	116	126	136	146	155	165	174	184	193	203	213	222	232
3 8	95	105	114	123	133	142	152	161	171	180	189	199	208	217	227
3 9	93	102	112	121	130	139	148	158	167	176	185	194	203	213	222
3 10	91	100	109	118	127	137	145	154	163	172	181	190	199	209	217
3 11	89	98	107	116	125	134	142	151	160	169	178	186	195	204	213
4 0	87	96	105	113	122	131	140	148	157	166	174	183	191	200	208
4 1	86	94	103	111	120	128	137	145	154	162	170	179	188	196	204
4 2	84	92	101	109	118	126	134	142	151	159	167	176	184	192	200
4 3	82	91	99	107	115	123	132	140	148	156	164	172	180	189	197
4 4	81	88	97	105	113	121	129	137	145	153	161	169	177	185	193
4 5	79	87	95	103	111	119	127	135	143	150	158	166	174	182	190
4 6	78	86	93	101	109	117	125	132	140	148	155	163	171	178	186
4 7	77	84	92	99	107	115	122	130	138	145	153	160	168	175	183
4 8	75	83	90	98	105	113	120	128	135	143	150	157	165	172	180
4 9	74	81	89	96	103	111	118	125	133	140	147	155	162	169	177
4 10	73	80	87	94	102	109	116	123	131	138	145	152	159	167	174
4 11	71	78	86	93	100	107	114	121	129	136	143	150	157	164	171

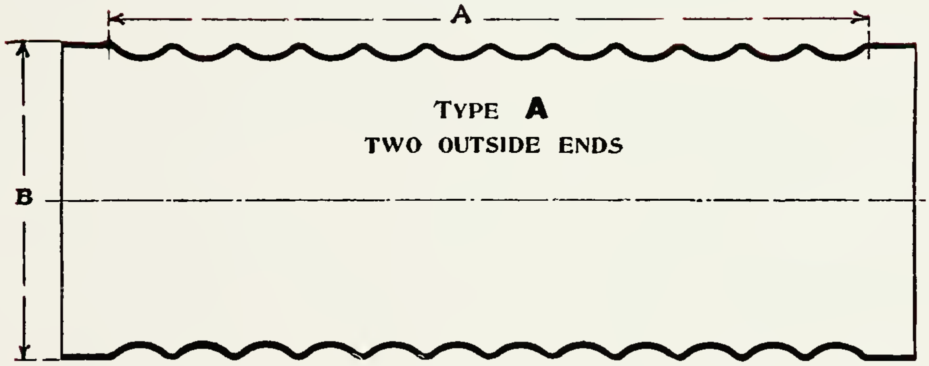


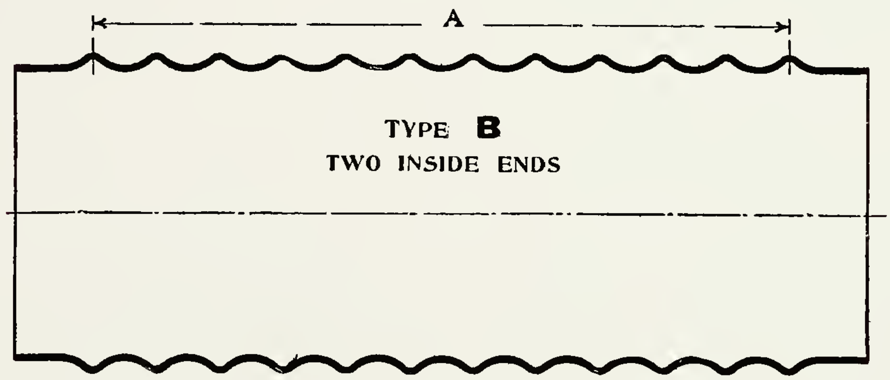
INTERNAL FURNACE BOILERS AT 14th STREET STATION,
CONSOLIDATED GAS COMPANY NEW YORK.

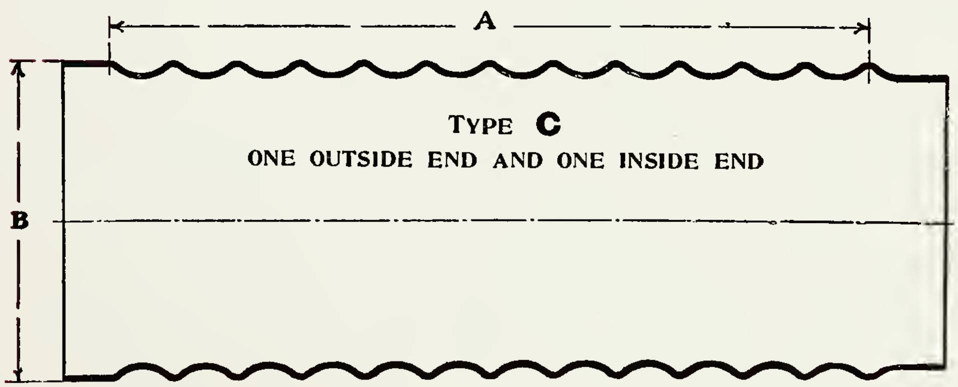
TYPES OF MORISON SUSPENSION FURNACE

WITH

PLAIN ENDS.







MANUFACTURED BY

THE CONTINENTAL IRON WORKS,

NEW YORK.

(BOROUGH OF BROOKLYN.)

RATING THE POWER OF BOILERS.

The term Horse Power, as used in relation to steam boilers, is the capacity to evaporate 30 pounds of water per hour from a temperature of 100° Fahrenheit into steam at 70 pounds gauge pressure, or 34½ pounds of water evaporated per hour, from a feed water temperature of 212° F. into steam at atmospheric pressure. This unit of power is that adopted by the American Society of Mechanical Engineers and generally accepted as a standard.

In many tests made upon boilers of the Internal Furnace Type they have evaporated 10 pounds of water per pound of coal burned per hour. In designing the Internal Furnace Boilers illustrated, an evaporation of 10 pounds of water per pound of coal, having 10% ash, burned, and a consumption of 18 pounds of coal per square foot of grate per hour, have been used as a basis. With the above data a simple calculation shows that these boilers will produce 5 Boiler Horse Power per square foot of grate.

The following table gives the general proportions and sizes upon which the various designs have been carried out.

General Proportions of Internal Furnace Boilers Ranging from 75 to 300 H. P. designed by

THE CONTINENTAL IRON WORKS.

Rated Horse Power	75	100	125	150	200	250	300
Grate Surface in square feet	15	20	25	30	40	50	60
Heating Surface in sq. feet	527	733	905	1071	1423	1780	2157
Ratio of H. S. to G. S	35.2 to 1	36.6 to 1	36.2 to 1	35.7 to 1	35.6 to 1	35.6 to 1	35.9 to 1
Diameter of Tubes	3½ in.	3½ in.	3½ in.	3½ in.	3½ in.	3½ in.	3½ in.
Number of Tubes	42	56	70	80	108	137	161
Length of Tubes	11 ft. 6 in.	12 ft. 6 in.	12 ft. 6 in.	13 ft. 0 in.	12 ft. 6 in.	12 ft. 6 in.	13 ft. 0 in.
Area through Tubes in square feet	2.44	3.25	4.06	4.64	6.26	7.95	9.34
Ratio Area through Tubes to G. S.	1 to 6.15	1 to 6.15	1 to 6.15	1 to 6.46	1 to 6.39	1 to 6.40	1 to 6.42
Inside Diameter of Boiler Shell	6 ft. 6 in.	7 ft. 0 in.	7 ft. 6 in.	8 ft. 0 in.	9 ft. 6 in.	10 ft. 6 in.	11 ft. 6 in.
Inside Diameter of Corrugated Furnace	36 in.	38 in.	45 in.	50 in.	38 in.	45 in.	50 in.
Length of the Grate	5 ft. 0 in.	6 ft. 4 in.	6 ft. 8 in.	7 ft. 3 in.	6 ft. 4 in.	6 ft. 8 in.	7 ft. 3 in.
Depth of Combustion Chamber	2 ft. 0 in.	2 ft. 0 in.	2 ft. 0 in.	2 ft. 0 in.	2 ft. 0 in.	2 ft. 0 in.	2 ft. 0 in.

DESIGN OF A

75 H. P. BOILER.

Internal Furnace Boiler of 75 Horse Power,

designed by

The Continental Iron Works, New York (Borough of Brooklyn).

1898.

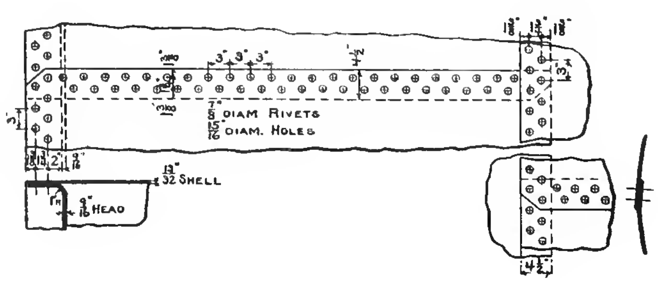
Scale for Boiler Elevations.

Scale for Riveting Plans.

100 lbs. Steam Pressure.

Length of Boiler over all	14 ft. 8 ins.
Thickness of Shell	$\frac{13}{32}$ in.
Thickness of Heads	$\frac{9}{16}$ in.
Thickness of Morison Furnace	$\frac{5}{16}$ in.
Diameter of Steel Through Bolts	2 ins.
Diameter of Threaded Bolt Ends	$2\frac{3}{8}$ ins.

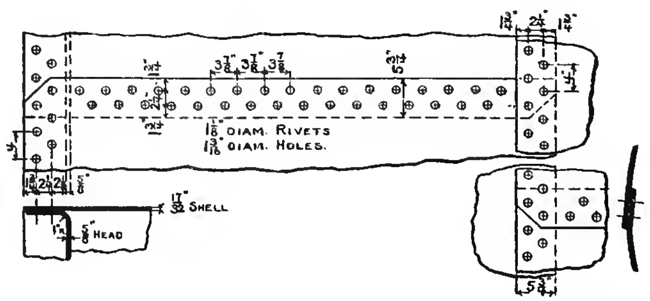
Plan of Riveting.



130 lbs. Steam Pressure.

Length of Boiler over all	14 ft. 9 ins.
Thickness of Shell	$\frac{17}{32}$ in.
Thickness of Heads	$\frac{5}{8}$ in.
Thickness of Morison Furnace	$\frac{3}{8}$ in.
Diameter of Steel Through Bolts	$2\frac{1}{4}$ ins.
Diameter of Threaded Bolt Ends	$2\frac{5}{8}$ ins.

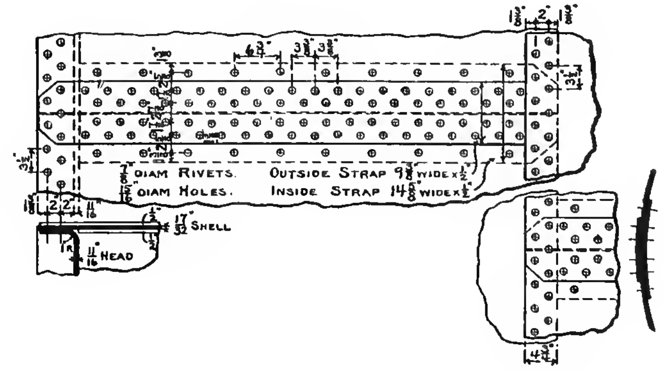
Plan of Riveting.



160 lbs. Steam Pressure.

Length of Boiler over all	14 ft. $8\frac{1}{4}$ ins.
Thickness of Shell	$\frac{17}{32}$ in.
Thickness of Heads	$\frac{11}{16}$ in.
Thickness of Morison Furnace	$\frac{7}{16}$ in.
Diameter of Steel Through Bolts	$2\frac{1}{2}$ ins.
Diameter of Threaded Bolt Ends	$2\frac{7}{8}$ ins.

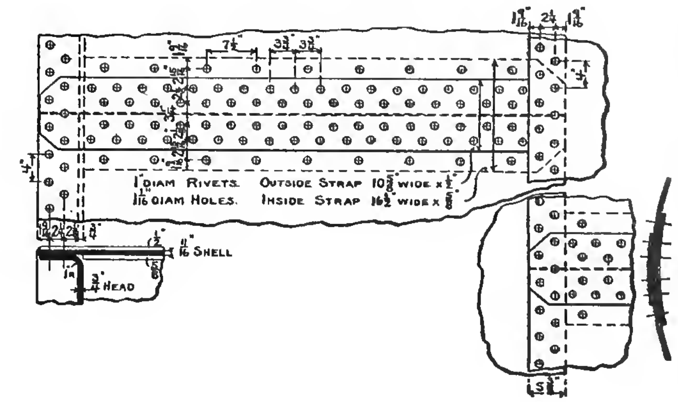
Plan of Riveting.

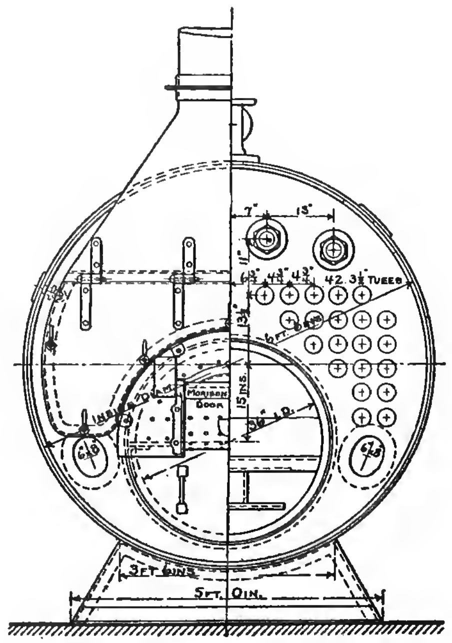


200 lbs. Steam Pressure.

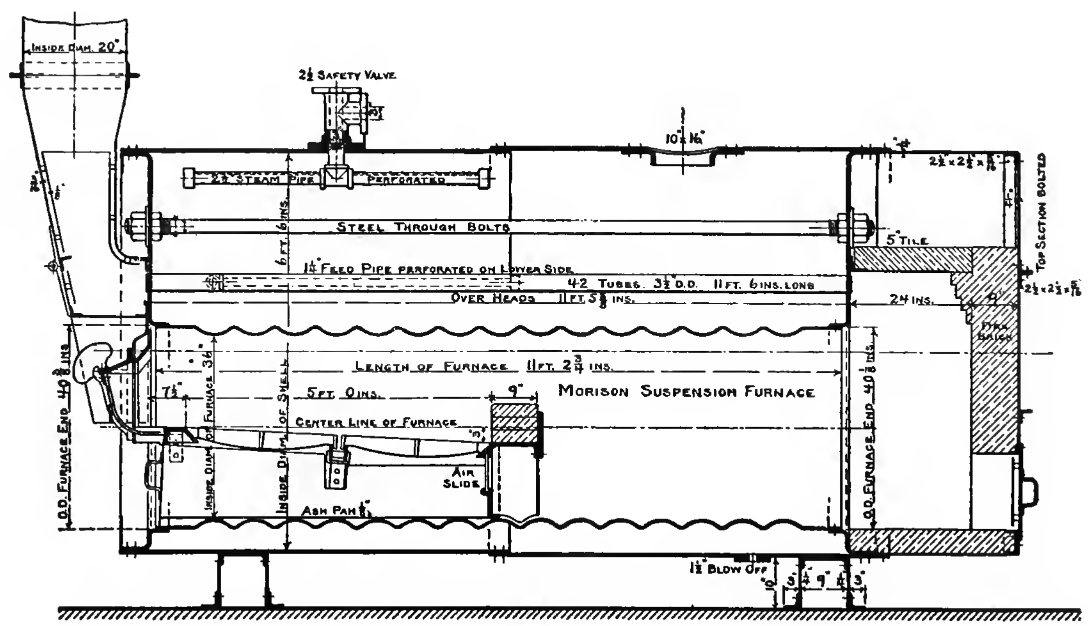
Length of Boiler over all	14 ft. 9 ins.
Thickness of Shell	$\frac{11}{16}$ in.
Thickness of Heads	$\frac{3}{4}$ in.
Thickness of Morison Furnace	$\frac{9}{16}$ in.
Diameter of Steel Through Bolts	$2\frac{5}{8}$ ins.
Diameter of Threaded Bolt Ends	3 ins.

Plan of Riveting.

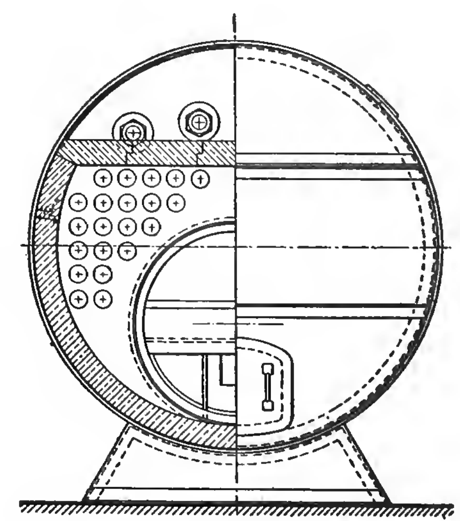




Front Exterior Elevation.



Longitudinal Sectional Elevation.



Sectional Elevation. Rear Exterior Elevation.

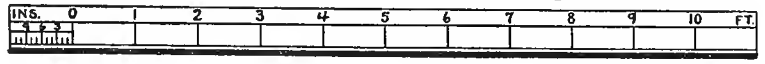
Internal Furnace Boiler of 100 Horse Power,

designed by

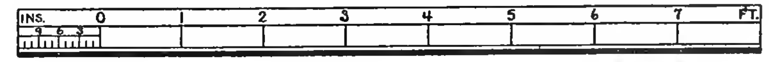
The Continental Iron Works, New York (Borough of Brooklyn).

1898.

Scale for Boiler Elevations.



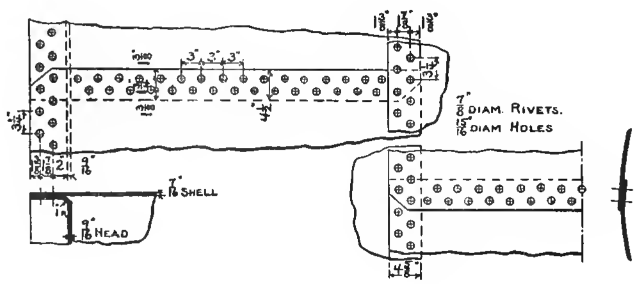
Scale for Riveting Plans.



100 lbs. Steam Pressure.

Length of Boiler over all — 15 ft $8\frac{3}{4}$ ins.
Thickness of Shell — $\frac{7}{16}$ in.
Thickness of Heads — $\frac{9}{16}$ in.
Thickness of Morison Furnace — $\frac{5}{16}$ in.
Diameter of Steel Through Bolts — 2 ins.
Diameter of Threaded Bolt Ends — $2\frac{3}{8}$ ins.

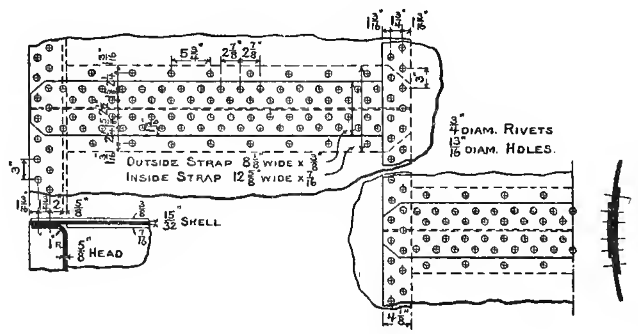
Plan of Riveting.



130 lbs. Steam Pressure.

Length of Boiler over all — 15 ft. 8 ins.
Thickness of Shell — $\frac{15}{32}$ in.
Thickness of Heads — $\frac{5}{8}$ in.
Thickness of Morison Furnace — $\frac{3}{8}$ in.
Diameter of Steel Through Bolts — $2\frac{1}{4}$ ins.
Diameter of Threaded Bolt Ends — $2\frac{5}{8}$ ins.

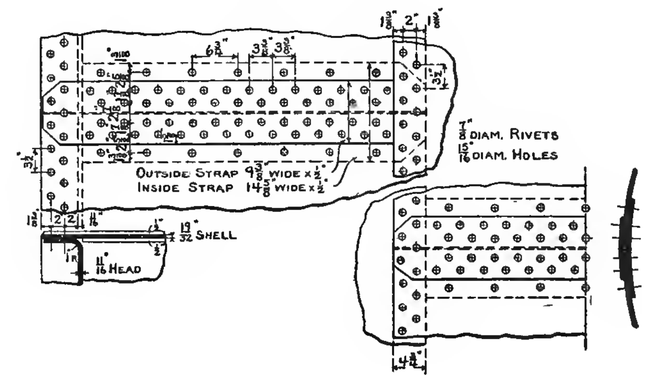
Plan of Riveting.



160 lbs. Steam Pressure.

Length of Boiler over all — 15 ft. $8\frac{1}{4}$ ins.
Thickness of Shell — $\frac{19}{32}$ in.
Thickness of Heads — $\frac{11}{16}$ in.
Thickness of Morison Furnace — $\frac{15}{32}$ in.
Diameter of Steel Through Bolts — $2\frac{1}{2}$ ins.
Diameter of Threaded Bolt Ends — $2\frac{7}{8}$ ins.

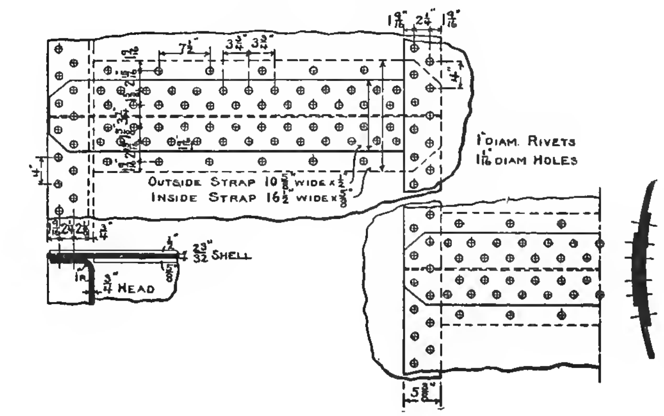
Plan of Riveting.

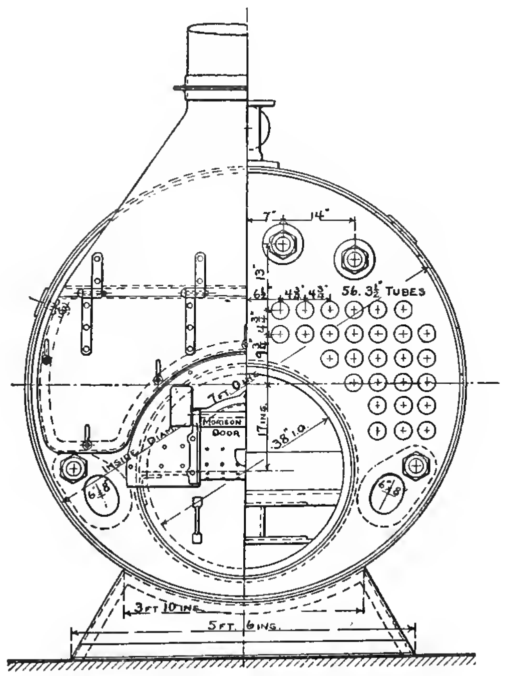


200 lbs. Steam Pressure.

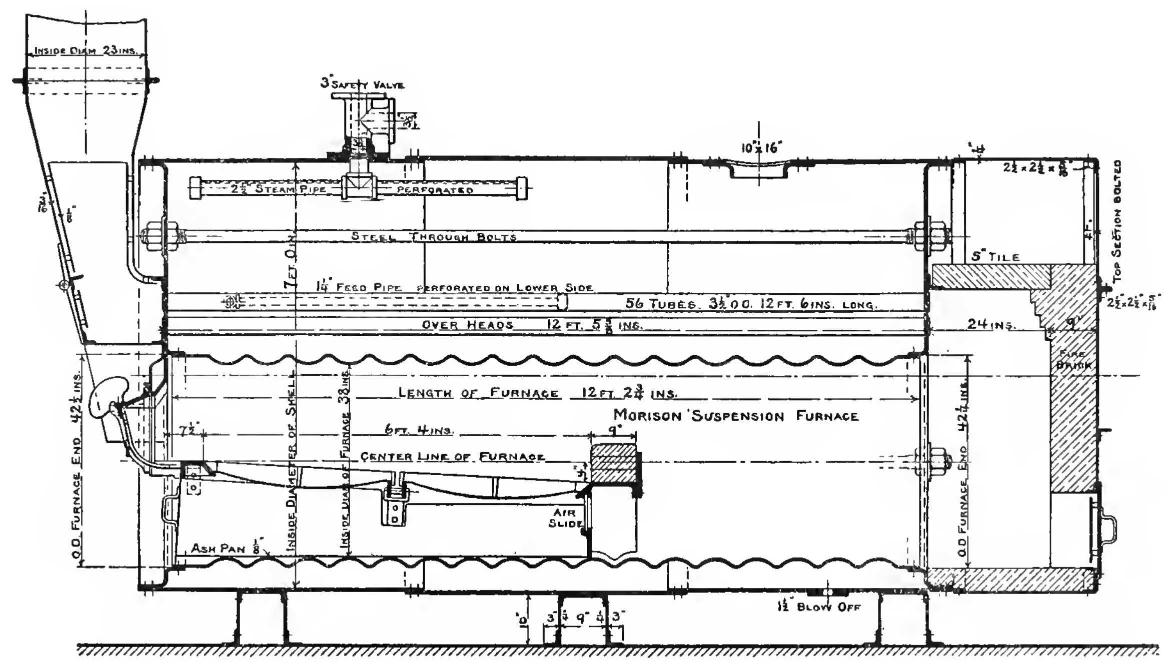
Length of Boiler over all — 15 ft. 9 ins.
Thickness of Shell — $\frac{23}{32}$ in.
Thickness of Heads — $\frac{3}{4}$ in.
Thickness of Morison Furnace — $\frac{19}{32}$ in.
Diameter of Steel Through Bolts — $2\frac{5}{8}$ ins.
Diameter of Threaded Bolt Ends — 3 ins.

Plan of Riveting.

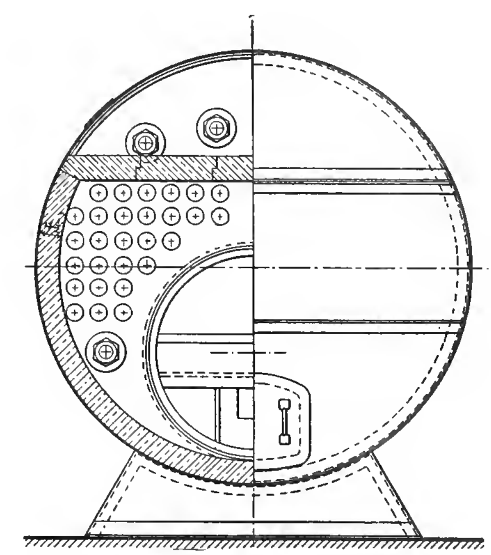




Front Exterior Elevation.



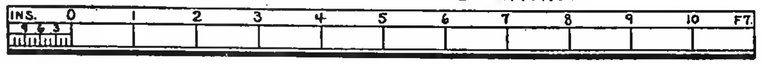
Longitudinal Sectional Elevation.



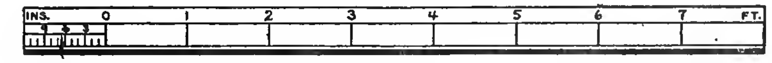
Sectional Elevation. Rear Exterior Elevation.

Internal Furnace Boiler of 125 Horse Power,
designed by
The Continental Iron Works, New York (Borough of Brooklyn).
1898.

Scale for Boiler Elevations.



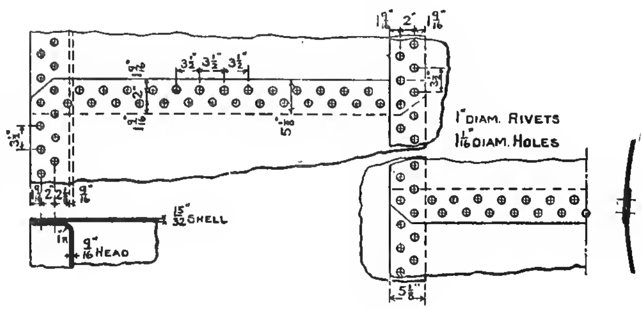
Scale for Riveting Plans.



100 lbs. Steam Pressure.

Length of Boiler over all — 15 ft. 8¾ ins.
Thickness of Shell — 15/32 in.
Thickness of Heads — 9/16 in.
Thickness of Morison Furnace — 11/32 in.
Diameter of Steel Through Bolts — 2 ins.
Diameter of Threaded Bolt Ends — 2⅜ ins.

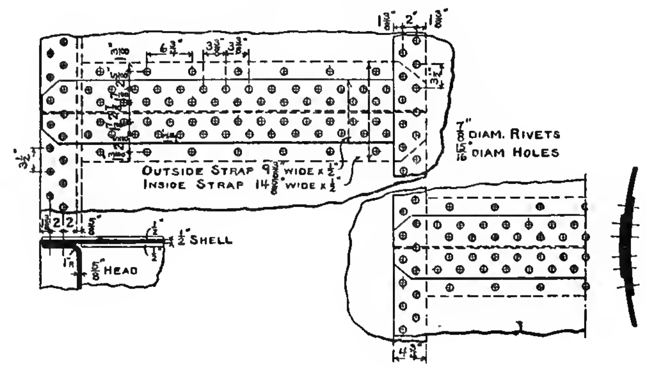
Plan of Riveting.



130 lbs. Steam Pressure.

Length of Boiler over all — 15 ft. 8¼ ins.
Thickness of Shell — ½ in.
Thickness of Heads — ⅝ in.
Thickness of Morison Furnace — 7/16 in.
Diameter of Steel Through Bolts — 2¼ ins.
Diameter of Threaded Bolt Ends — 2⅝ ins.

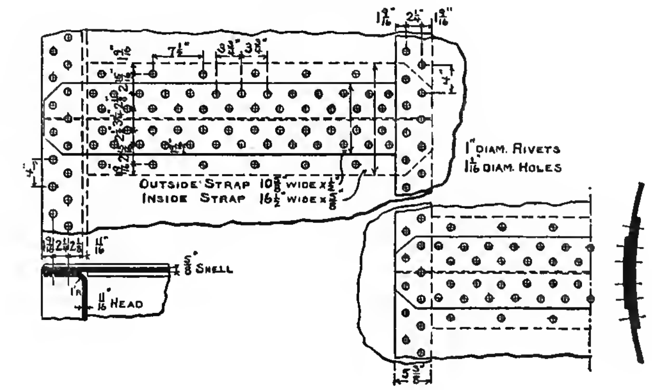
Plan of Riveting.



160 lbs. Steam Pressure.

Length of Boiler over all — 15 ft. 9 ins.
Thickness of Shell — ⅝ in.
Thickness of Heads — 11/16 in.
Thickness of Morison Furnace — 9/16 in.
Diameter of Steel Through Bolts — 2½ ins.
Diameter of Threaded Bolt Ends — 2⅞ ins.

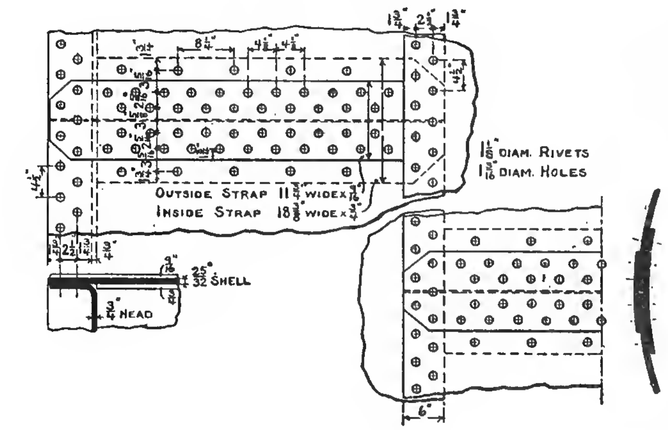
Plan of Riveting.

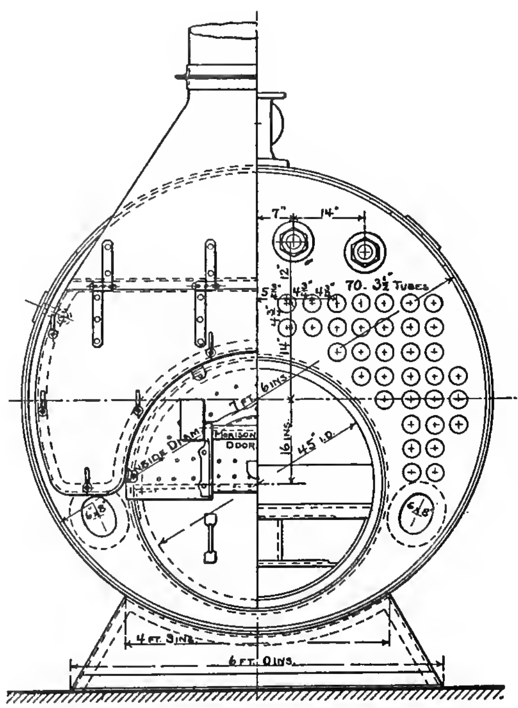


200 lbs. Steam Pressure.

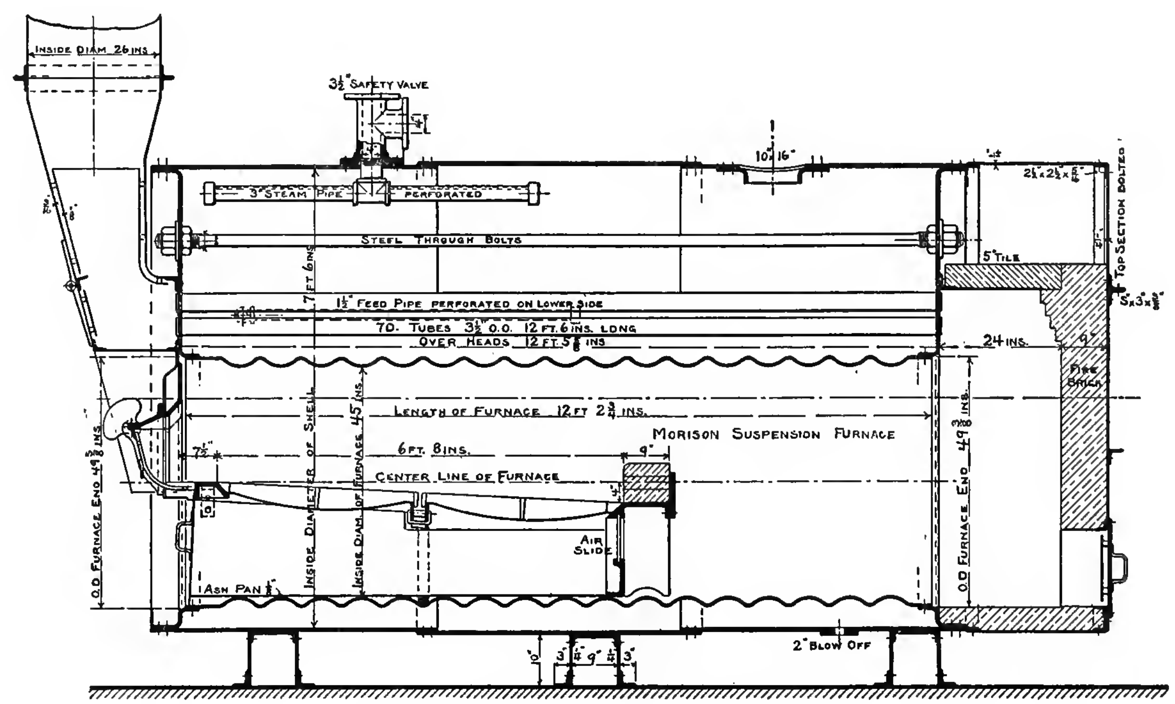
Length of Boiler over all — 15 ft. 9¼ ins.
Thickness of Shell — 25/32 in.
Thickness of Heads — ¾ in.
Thickness of Morison Furnace — 11/16 in.
Diameter of Steel Through Bolts — 2⅝ ins.
Diameter of Threaded Bolt Ends — 3 ins.

Plan of Riveting.

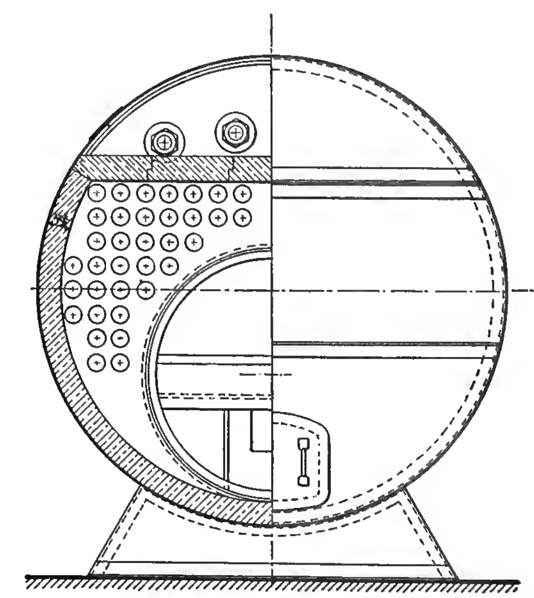




Front Exterior Elevation.



Longitudinal Sectional Elevation.



Sectional Elevation. Rear Exterior Elevation.

Internal Furnace Boiler of 150 Horse Power,

designed by

The Continental Iron Works, New York (Borough of Brooklyn).

1898.

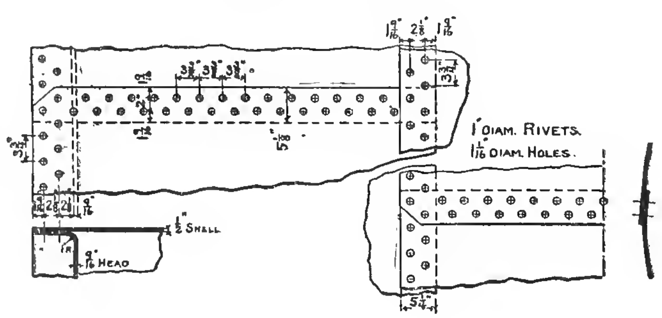
Scale for Boiler Elevations.

Scale for Riveting Plans.

100 lbs. Steam Pressure.

Length of Boiler over all — 16 ft. 2¾ ins.
Thickness of Shell — ½ in.
Thickness of Heads — 9/16 in.
Thickness of Morison Furnace — ⅜ in.
Diameter of Steel Through Bolts — 2 ins.
Diameter of Threaded Bolt Ends — 2⅜ ins.

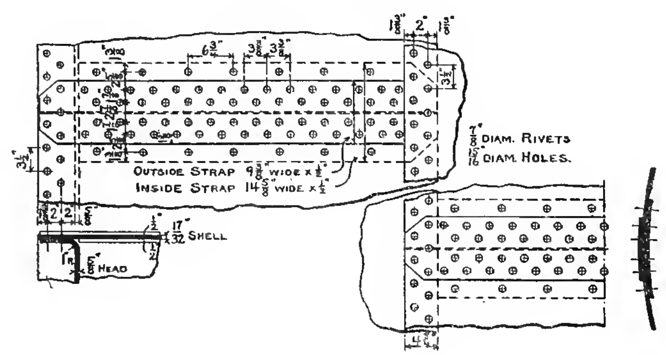
Plan of Riveting.



130 lbs. Steam Pressure.

Length of Boiler over all — 16 ft. 2¼ ins.
Thickness of Shell — 17/32 in.
Thickness of Heads — ⅝ in.
Thickness of Morison Furnace — ½ in.
Diameter of Steel Through Bolts — 2¼ ins.
Diameter of Threaded Bolt Ends — 2⅝ ins.

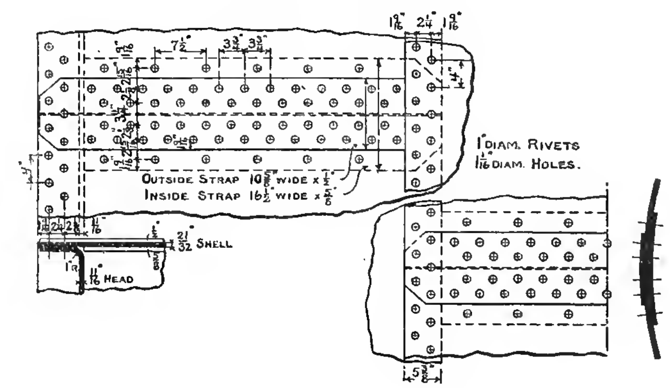
Plan of Riveting.



160 lbs. Steam Pressure.

Length of Boiler over all — 16 ft. 3 ins.
Thickness of Shell — 21/32 in.
Thickness of Heads — 11/16 in.
Thickness of Morison Furnace — ⅝ in.
Diameter of Steel Through Bolts — 2½ ins.
Diameter of Threaded Bolt Ends — 2⅞ ins.

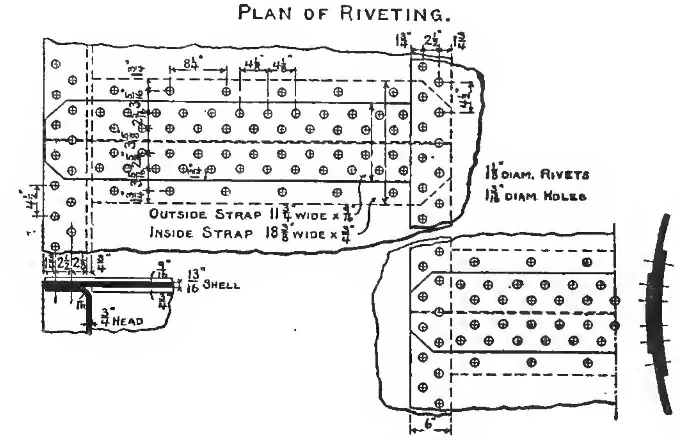
Plan of Riveting.

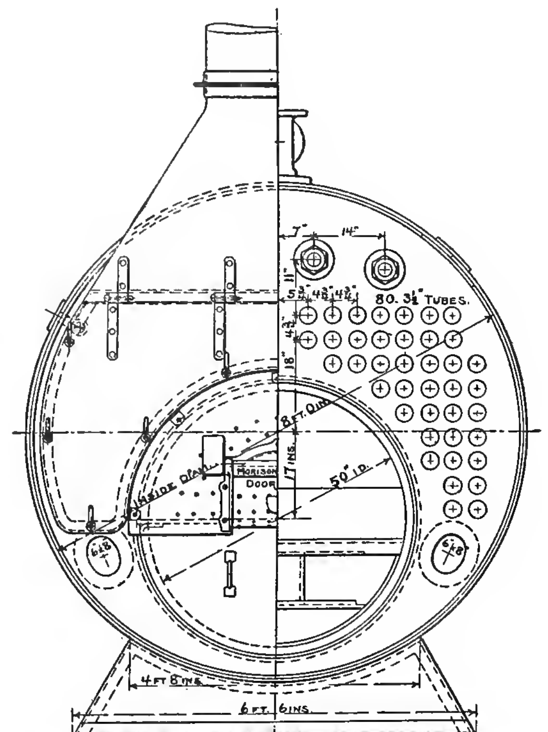


200 lbs. Steam Pressure.

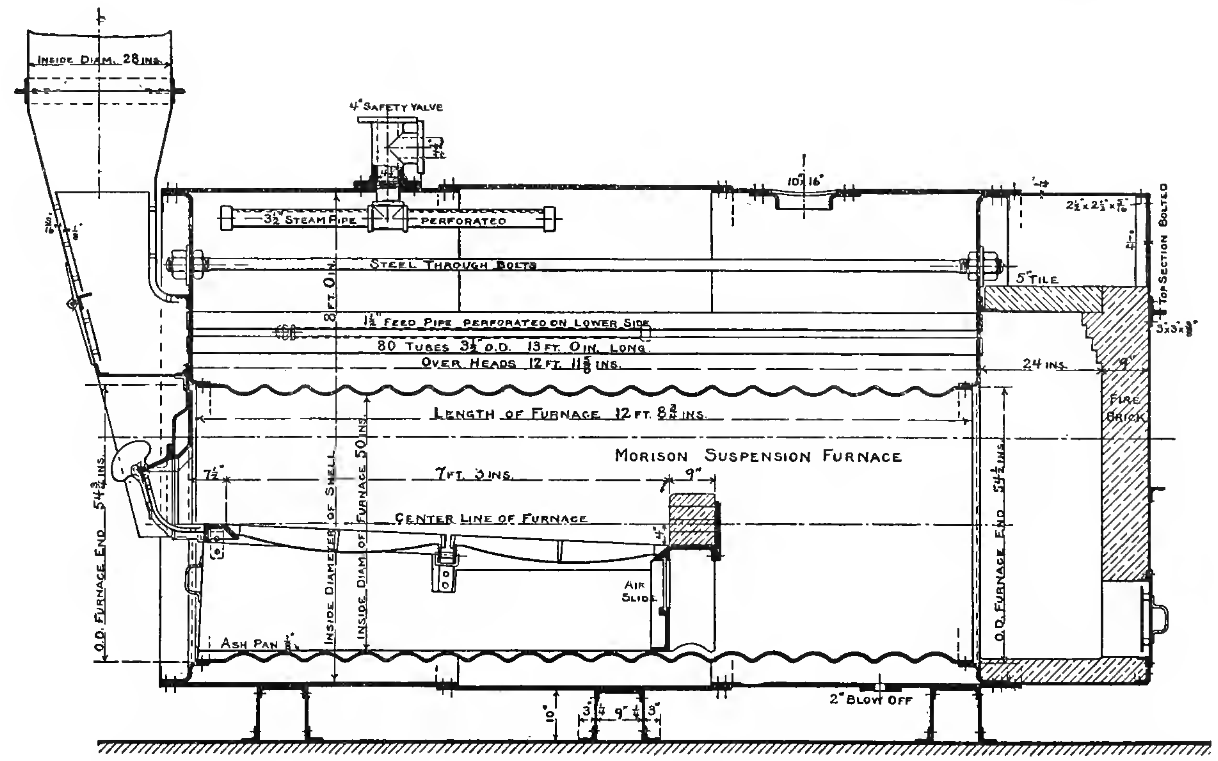
Length of Boiler over all — 16 ft. 3¼ ins.
Thickness of Shell — 13/16 in.
Thickness of Heads — ¾ in.
Thickness of Morison Furnace — ¾ in.
Diameter of Steel Through Bolts — 2⅝ ins.
Diameter of Threaded Bolt Ends — 3 ins.

Plan of Riveting.

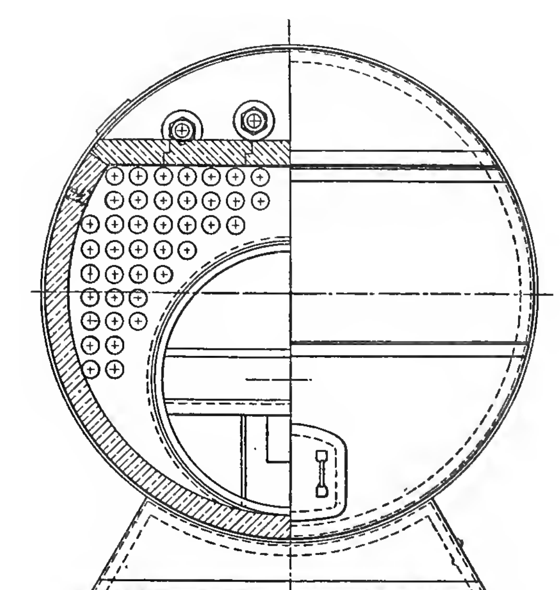




Front Exterior Elevation.



Longitudinal Sectional Elevation.



Sectional Elevation. Rear Exterior Elevation.

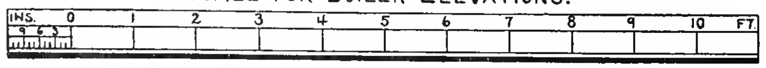
Internal Furnace Boiler of 200 Horse Power,

designed by

The Continental Iron Works, New York (Borough of Brooklyn).

1898.

Scale for Boiler Elevations.

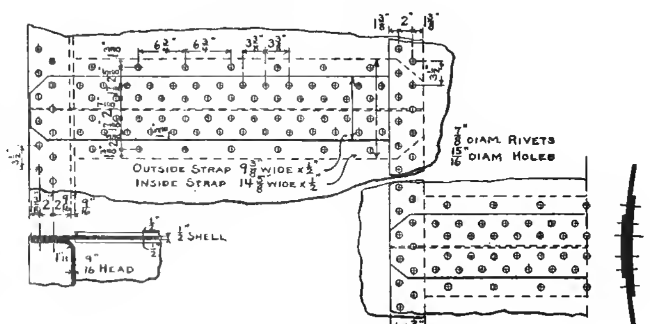


Scale for Riveting Plans.

100 lbs. Steam Pressure.

Length of Boiler over all — 15 ft. 9 ins.
Thickness of Shell — $\frac{1}{2}$ in.
Thickness of Heads — $\frac{9}{16}$ in.
Thickness of Morison Furnaces — $\frac{5}{16}$ in.
Diameter of Steel Through Bolts — 2 ins.
Diameter of Threaded Bolt Ends — $2\frac{3}{8}$ ins.

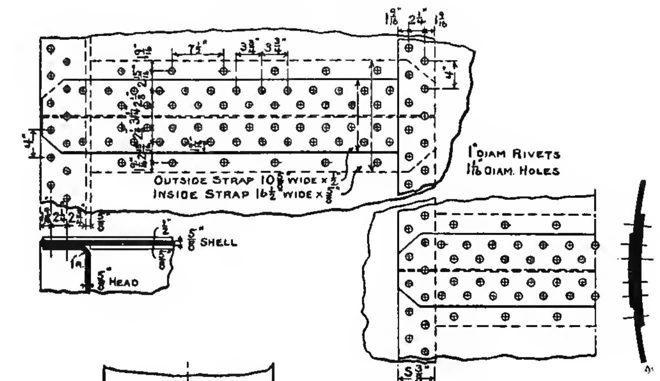
Plan of Riveting.



130 lbs. Steam Pressure.

Length of Boiler over all — 15 ft. $9\frac{1}{2}$ ins.
Thickness of Shell — $\frac{5}{8}$ in.
Thickness of Heads — $\frac{5}{8}$ in.
Thickness of Morison Furnaces — $\frac{3}{8}$ in.
Diameter of Steel Through Bolts — $2\frac{1}{4}$ ins.
Diameter of Threaded Bolt Ends — $2\frac{5}{8}$ ins.

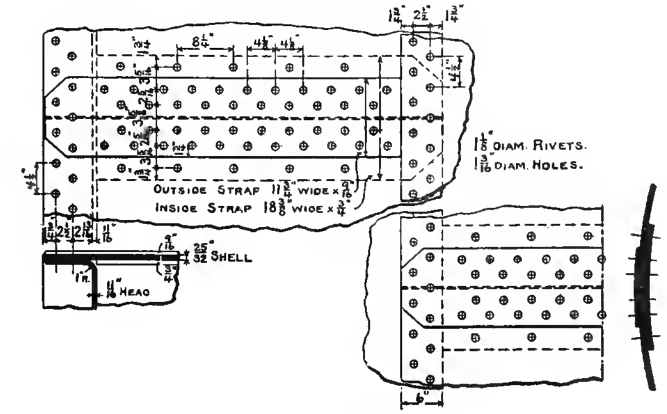
Plan of Riveting.



160 lbs. Steam Pressure.

Length of Boiler over all — 15 ft. 10 ins.
Thickness of Shell — $\frac{25}{32}$ in.
Thickness of Heads — $\frac{11}{16}$ in.
Thickness of Morison Furnaces — $\frac{15}{32}$ in.
Diameter of Steel Through Bolts — $2\frac{1}{2}$ ins.
Diameter of Threaded Bolt Ends — $2\frac{7}{8}$ ins.

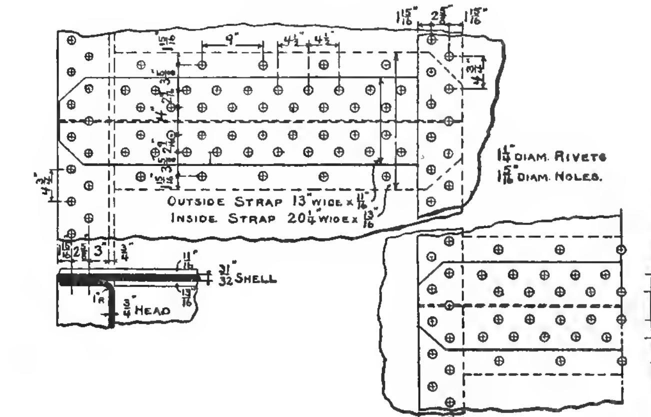
Plan of Riveting.

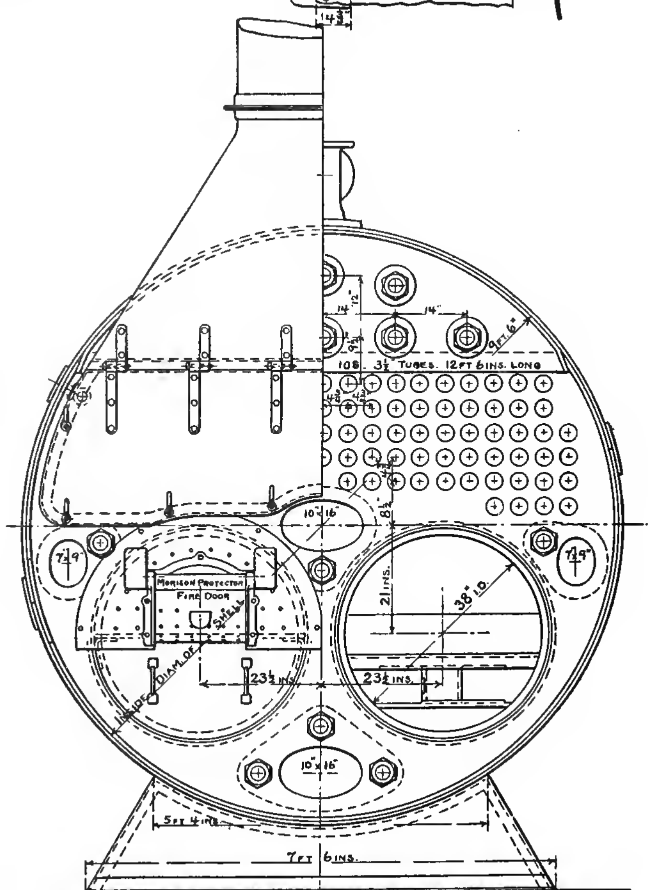


200 lbs. Steam Pressure.

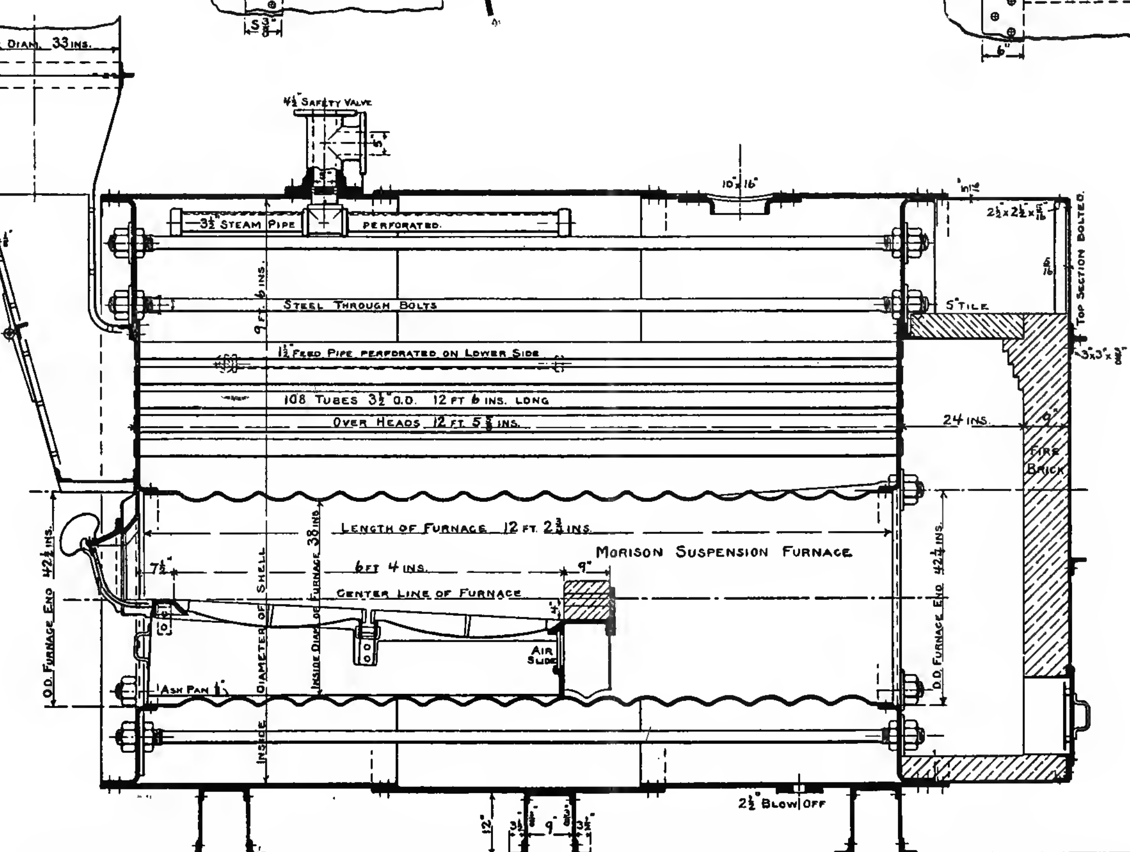
Length of Boiler over all — 15 ft. $10\frac{1}{2}$ ins.
Thickness of Shell — $\frac{31}{32}$ in.
Thickness of Heads — $\frac{3}{4}$ in.
Thickness of Morison Furnaces — $\frac{19}{32}$ in.
Diameter of Steel Through Bolts — $2\frac{5}{8}$ ins.
Diameter of Threaded Bolt Ends — 3 ins.

Plan of Riveting.

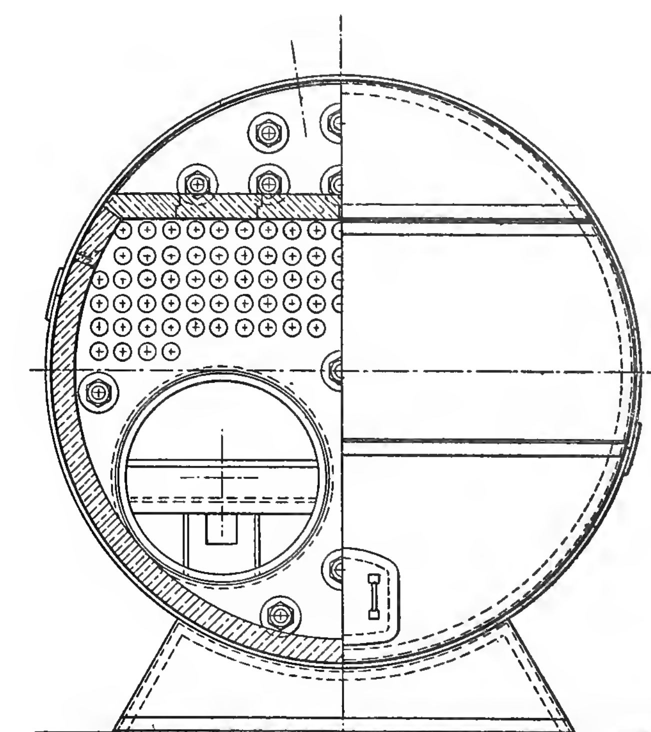




Front Exterior Elevation



Longitudinal Sectional Elevation.



Sectional Elevation. Rear Exterior Elevation.

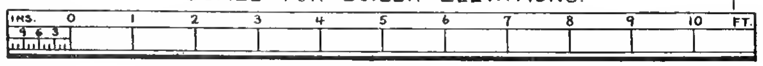
Internal Furnace Boiler of 300 Horse Power,

designed by

The Continental Iron Works, New York (Borough of Brooklyn).

1898.

Scale for Boiler Elevations.

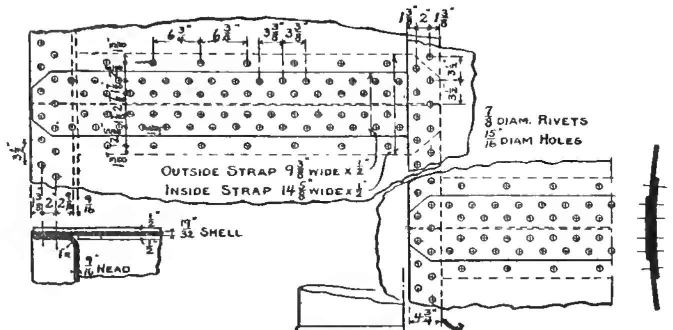


Scale for Riveting Plans.

100 lbs. Steam Pressure.

Length of Boiler over all — 16 ft 3 ins.
Thickness of Shell — $\frac{19}{32}$ in.
Thickness of Heads — $\frac{9}{16}$ in.
Thickness of Morison Furnaces — $\frac{3}{8}$ in.
Diameter of Steel Through Bolts — 2 ins.
Diameter of Threaded Bolt Ends — $2\frac{3}{8}$ ins.

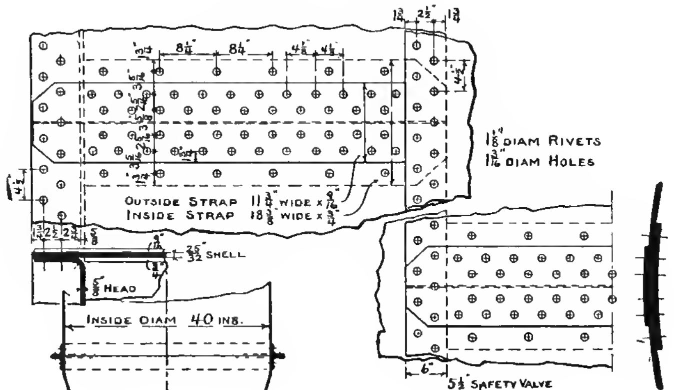
Plan of Riveting.



130 lbs. Steam Pressure.

Length of Boiler over all — 16 ft. 4 ins.
Thickness of Shell — $\frac{25}{32}$ in.
Thickness of Heads — $\frac{5}{8}$ in.
Thickness of Morison Furnaces — $\frac{1}{2}$ in
Diameter of Steel Through Bolts — $2\frac{1}{4}$ ins.
Diameter of Threaded Bolt Ends — $2\frac{5}{8}$ ins.

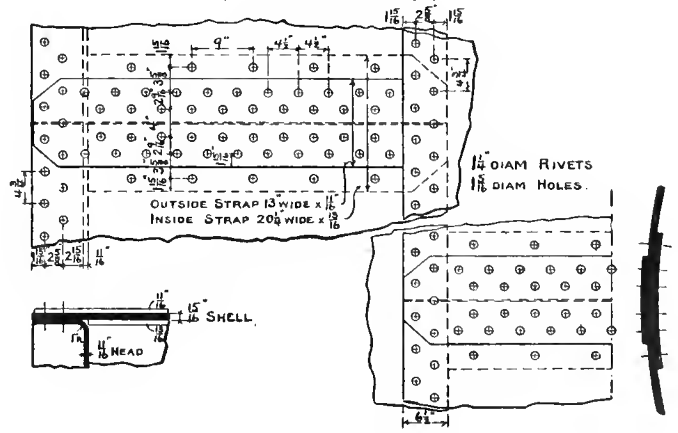
Plan of Riveting.



160 lbs. Steam Pressure

Length of Boiler over all — 16 ft. $4\frac{1}{2}$ ins
Thickness of Shell — $\frac{15}{16}$ in.
Thickness of Heads — $\frac{11}{16}$ in.
Thickness of Morison Furnaces — $\frac{5}{8}$ in.
Diameter of Steel Through Bolts — $2\frac{1}{2}$ ins.
Diameter of Threaded Bolt Ends — $2\frac{7}{8}$ ins.

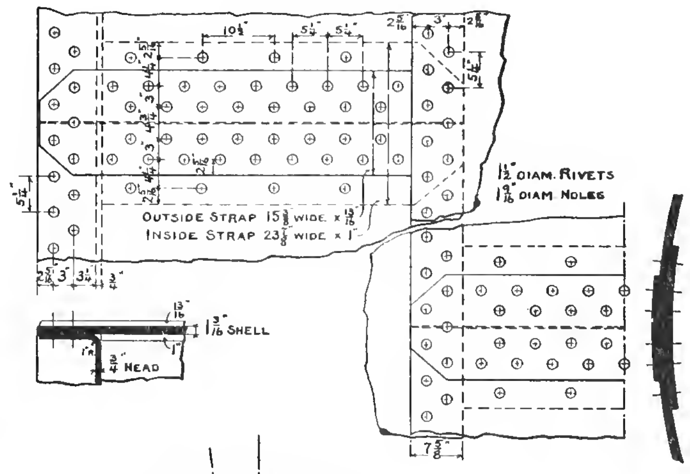
Plan of Riveting.

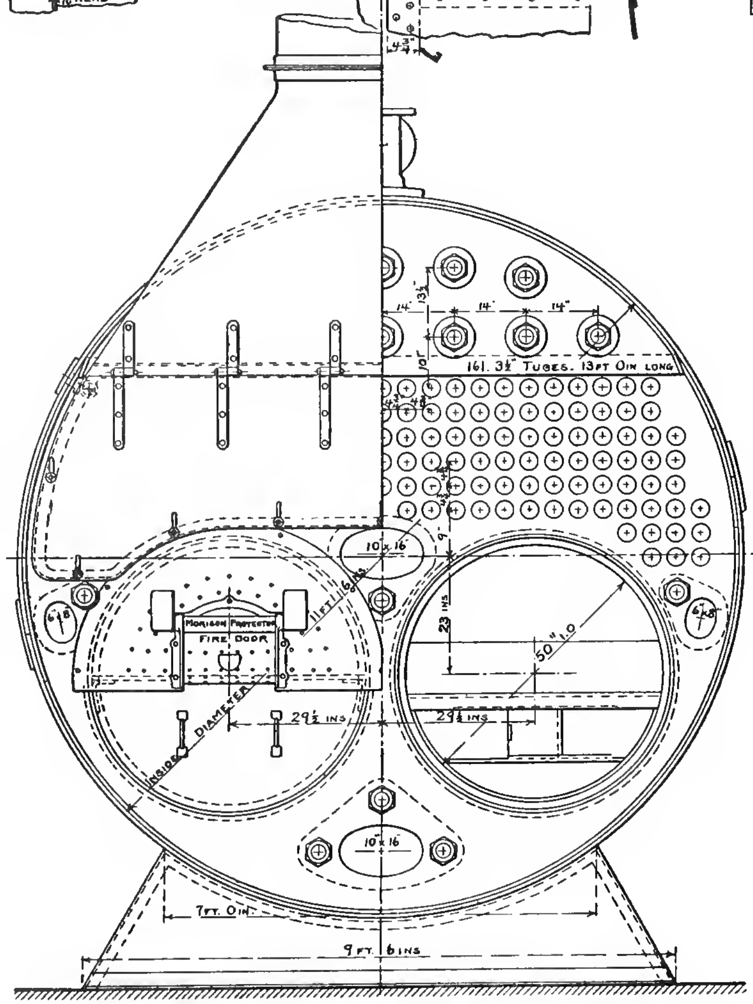


200 lbs. Steam Pressure.

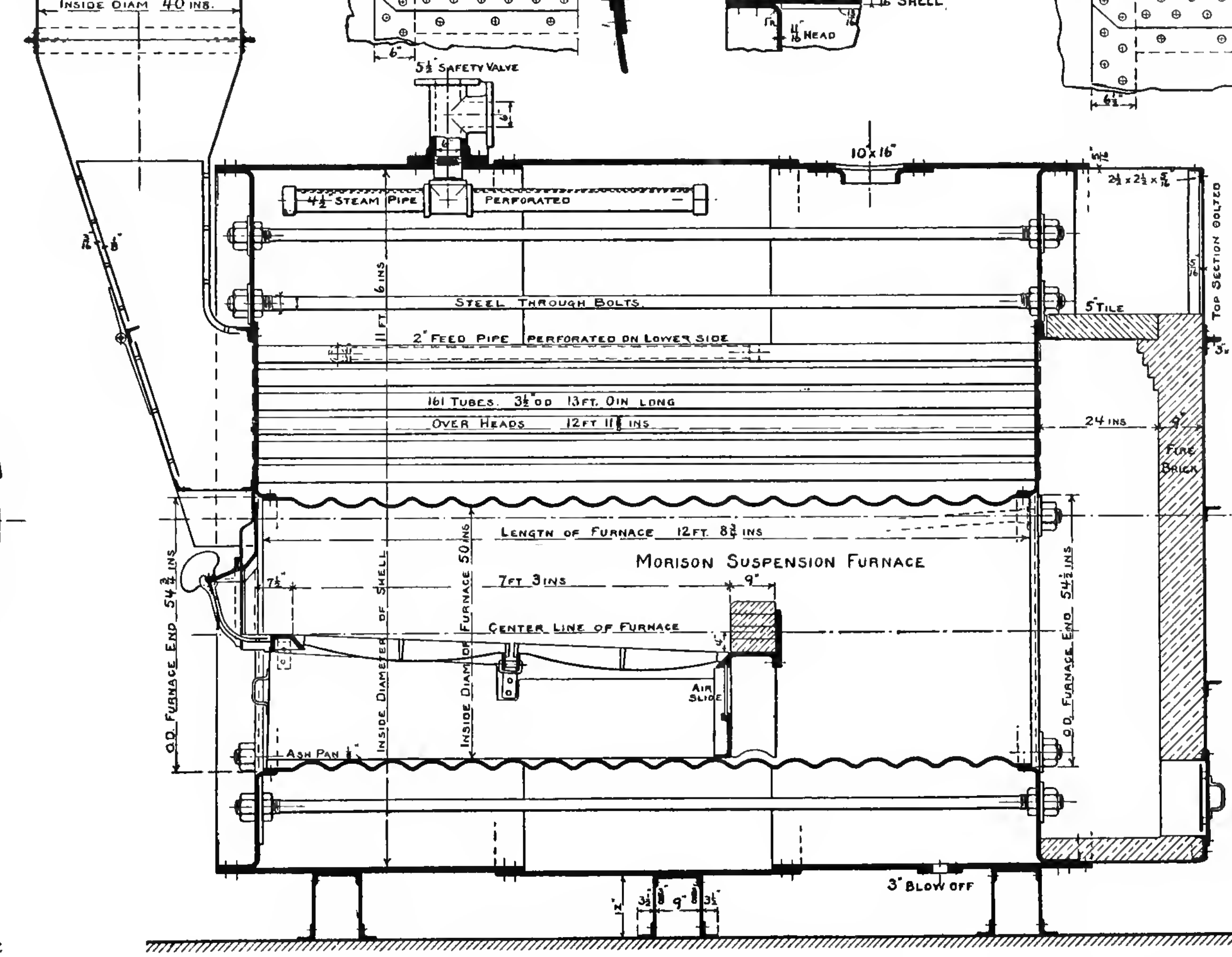
Length of Boiler over all — 16 ft $5\frac{1}{2}$ ins.
Thickness of Shell — $1\frac{3}{16}$ ins.
Thickness of Heads — $\frac{3}{4}$ in.
Thickness of Morison Furnaces — $\frac{3}{4}$ in.
Diameter of Steel Through Bolts — $2\frac{5}{8}$ ins.
Diameter of Threaded Bolt Ends — 3 ins.

Plan of Riveting.

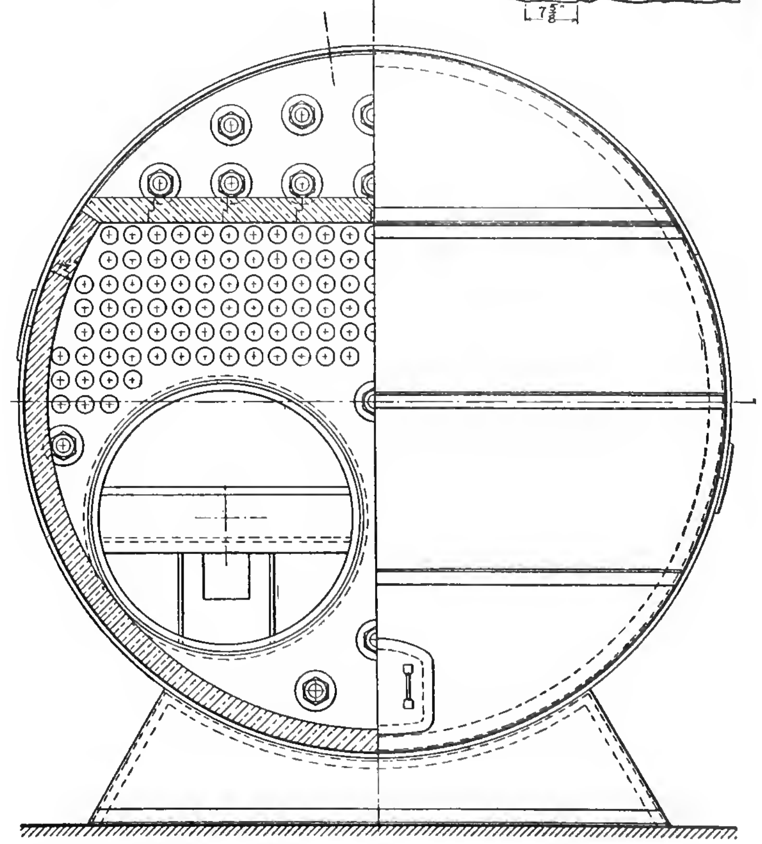




Front Exterior Elevation.



Longitudinal Sectional Elevation.



Sectional Elevation — Rear Exterior Elevation.

NOTES.

IN designing INTERNAL FURNACE BOILERS WITH MORISON SUSPENSION FURNACES, be sure that dimension A, in inches, types A, B and C, page 15, representing the distance between the extreme corrugations, is divisible by 8.

The reason for so doing is the fact that the Suspension Curves are spaced 8 inches from center to center.

Dimension B, in types A and C, representing the outside diameter of the front end of furnace, should be at least $\frac{1}{4}$ of an inch greater than the outside diameter of the body of the furnace.

This allows the furnace to be readily passed through the flanged opening in the front head of the boiler.

HAVE PLENTY OF ROOM between the tubes and the furnace; also the tubes and the shell, and between the bottom of the furnace and shell. This is necessary, in order that the circulation of the water may be uninterrupted. We advise that none of these spaces be less than 3 inches.

WHEN INQUIRING FOR QUOTATIONS, ON MORISON SUSPENSION FURNACES, be particular to furnish the following data, viz.: Inside diameter, and total length of furnaces; also steam pressure to be carried, or the thickness of the furnaces, as determined from the table on page 13.

ESTIMATES FURNISHED ON APPLICATION for any size Morison Suspension Furnace, from 28 inches inside diameter, any thickness from $\frac{5}{16}$ to $\frac{3}{4}$ of an inch, and of any length. All quotations are for delivery F. O. B. New York.

WHEN ORDERING MORISON SUSPENSION FURNACES, to avoid confusion, it is better to send a sketch of the furnaces required, with figures giving the inside diameter, length over all, length of plain part at each end, outside diameter at each end, thickness of metal, or the pressure to be carried.

It is necessary to note that furnaces will be practically cylindrical, and formed **TO THE DIMENSIONS FURNISHED,** so all allowances of whatever nature must be made by the party ordering them.

In the event of information being desired in reference to **FURNACES WITH FLANGED ENDS,** please send for our book on Morison Suspension Furnaces for Marine Boilers.

INTERNAL FURNACE BOILERS AT RIDGEWOOD PUMPING STATION,

BROOKLYN CITY WATER WORKS.

FORM OF

SPECIFICATION

FOR

INTERNAL FURNACE BOILER

OF HORSE POWER.

GENERALLY. . . The Boiler is to be of Horse Power (one Horse Power to mean $34\frac{1}{2}$ lbs. of water evaporated per hour, from a feed water temperature of 212° Fah. into steam at Atmospheric pressure), and in all respects properly proportioned for a steam pressure of lbs. per square inch.

MATERIAL. . . The material from which the Boiler is to be constructed shall be of Open Hearth Flange Steel, ranging between 58,000 and 63,000 lbs. Tensile Strength. In a parallel test piece, 8 inches long, when tested to destruction, the elongation shall not be less than 25%, accompanied by a reduction of area, at the point of fracture of at least 50%. A similar test piece, shall permit of its ends being bent cold in a parallel direction, about a curve, whose inner radius shall not be more than the thickness of the test piece. This test to be made without fracture at any point.

The Shell of the Boiler to be inches, Inside Diameter, and inches, in thickness. The distribution of the plates, and also of the rivets, of the various joints to be, as shown by the drawing.

The front and rear heads, are to be inches thick, and to have their circumferential flanges of such diameter, as to properly fit the shell. These flanges to be turned to an internal radius of not less than one inch. The flanges of the furnace openings, in both the front and rear head, to be turned *inward* (in respect to the boiler) and to be of sufficient lengths for single rows of rivets. The Furnace opening of the front head, should be one-quarter of an inch greater in diameter, than the Furnace opening of the rear heads, to permit of the insertion and easy reeving of the Furnace into position.

FURNACE. . . . The Furnace to be of the MORISON SUSPENSION type, inches, inside diameter, by feet, and inches long, and inches thick, having plain parts, at the front and rear ends, of sufficient length to be single riveted to the furnace opening flanges of the boiler heads.

BACK CONNECTION. . The rear course of the boiler shell, is to extend about $2\frac{1}{2}$ inches, beyond the flange of the rear head, and to it, is to be bolted an extension forming a back connection. This extension may be of ordinary "tank steel," of sufficient width to provide for a combustion chamber, having a clear depth of 24 inches. Riveted to the inside of this extension, at its outer end, is to be a ring of

$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{16}$ inch angle, to which will be bolted a head of ordinary "tank steel," made in two pieces, joined together by bolts, as shown on the drawing. In the lower portion of this head, there is to be an opening surrounded by an angle iron ring, forming a door frame, 18 inches wide, by 15 inches high, to which will be fitted a suitable door, provided with latch, hinges and baffle plate. Across the head, there should be a stiffening angle bar.

The inside circumference of the Combustion Chamber, is to be lined with fire brick, placed on edge, forming a lining $4\frac{1}{2}$ inches thick. This lining should extend circumferentially upward, to a point one inch above the top of the upper row of tubes. The back of the Combustion Chamber should be lined with fire brick, 9 inches thick. This lining of the rear head, or back end, should be carried to the same height as the circumferential lining, and the opening at the top bridged over by fire brick tiles, 5 inches thick. One end of the tiles to rest upon an angle bar, riveted to the back head of the boiler, the other end upon the rear lining of the chamber.

RIVETS. . . . . The rivet holes are to be either drilled, or punched $\frac{1}{16}$ of an inch small, then reamed to requisite size. No drifting of unfair holes will be permitted. The rivet holes, at the furnace ends, are to be countersunk on the inside, and the rivets driven upon the inside of the furnace, leaving slightly spherical rivet heads.

The Boiler heads are to be braced with through bolts, inches diameter, upset at each end to inches diameter, and threaded. They are to be secured to the heads, with outside hexagonal nuts, provided with washers, 8 inches in diameter, and of $\frac{6}{16}$ the thickness of the boiler heads. Upon the inside, there are to be suitable washers and nuts (of half thickness) screwed up tight against the head. If preferred, the flat surfaces of the heads may be braced by means of the McGregor Solid Steel Braces, instead of the through bolts, as above described, in which case the braces are to be of sufficient number, and so located, as to thoroughly stay the heads.

MAN AND HAND HOLE OPENINGS. . . . Upon the top of the shell, there is to be located an Eclipse Man-hole and cover, 10×16 inch opening, provided with the usual clamps and bolt. In the front head, below the tubes, there are to be located Hand-hole openings, as shown, fitted with suitable covers and guards. The openings in the shell and heads, are to be reinforced by strengthening pieces, of equal section to the plate, in which the holes are cut, and securely riveted on the inside of the boiler.

FRONT CONNECTION. . The Front Connection, to be of the general design shown by the drawing, to be made of sheet metal $\frac{3}{16}$ of an inch thick, secured to the front head of the boiler, by $2\frac{1}{4} \times 2\frac{1}{4}$ angles and stud bolts, to have an interior lining of metal, $\frac{1}{8}$ of an inch thick, spaced 1 inch asunder, by means of thimbles. At its upper portion, it will be drawn to a suitable shape, and surrounded by a ring $2\frac{1}{2} \times 2\frac{1}{2} \times \frac{1}{4}$ angle, to provide for the reception of a smoke stack, inches in diameter. The front of the connection is to be provided with a door, fitted with forged hinges and latches, for securing it in place. The door to be provided with a lining, affording a one inch air space.

FURNACE DOORS, ETC. . . The front of the furnace, is to be closed by a MORISON PROTECTOR FURNACE FRONT AND DOOR, and below it, is to be fitted a sheet iron ash pit door, provided with two forged handles and proper means for holding it in position.

GRATE AND BRIDGE WALL. . There is to be a cast iron Bridge Wall, topped with fire brick, placed in the furnace, in a suitable position to provide for a grate area of square feet. Midway between it and the dead plate, of the furnace front, is to be located, a double bearer bar, the ends of which are to rest upon clips, securely fastened to the furnace. The Grate Bars to be of cast iron, provided with openings to suit the character of fuel to be used. Beneath the grate is to be an Ash Pan, formed of $\frac{1}{8}$ inch ordinary "tank steel," bent to shape, and extending from the Bridge Wall to front of furnace.

SADDLES. . . . The Boiler is to rest upon channel bar Saddles, conforming to the shape of the shell. Their flanges are to extend downward, and to them are to be riveted, side plates, along the lower edges, of which, there will be riveted angle bars, forming the bearing surfaces, resting on the foundations.

FITTINGS. . . . Upon the top of the shell, and about midway of the length of the front course, is to be located a cast iron flanged nozzle, inches diameter, so arranged as to provide at its upper flange for a inch safety valve, and at its side, a flanged nozzle to be suitable for attaching a steam connection.

Extending into the boiler from this cast iron nozzle, there will be a short pipe nipple, fitted to a Tee, from the longitudinal branches of which will extend a dry pipe inches diameter, each branch of which will be about 3 feet long, perforated along its upper surface with holes, giving an area of about $2\frac{1}{2}$ times the area of the steam pipe. Upon the side of the boiler will be located a feed pipe inches diameter. It will be formed of a short nipple entering the shell, to which will be connected, by means of an elbow, a pipe inches diameter extending about one-half the length of the boiler, having perforations along its lower surface, about twice the cross-sectional area of the pipe. This internal pipe will be located about the height of the top row of tubes, and parallel thereto, its extreme end being held in position by means of a suitable fastening. Located at the bottom of the shell, and at its extreme rear end will be provided an opening suitable for a inch diameter blow-off cock. The hole in the shell being reinforced by a pressed steel pipe flange riveted thereto.

TEST. . . . . . Before leaving the place of manufacture, the boiler will be completely filled with water, slightly warmed, and subjected to a test pressure of lbs. per square inch, and to be tight at that pressure.

TESTIMONIALS.

Newport News Light and Water Company,
No. 1 Broadway.

New York, October 25, 1895.

The Continental Iron Works,
Brooklyn (Greenpoint), N. Y.

Gentlemen:—Referring to our conversation of a day or two since, in respect to the relative merits of internally fired boilers and those fired externally; I have to say. For over two years, we have operated two internally fired boilers at our water pumping station in Virginia, with the most satisfactory results, having raised 500,000 gallons of water to an elevation of 185 ft., day after day, with a consumption of only 1500 to 1600 lbs. of coal.

If we were again to construct our Plant, we certainly should use internally fired boilers, believing them to be the most economical. In confirmation of the above opinion regarding boilers with internal furnaces, I have further to say, that at The Newport News Shipbuilding and Dry Dock Co. we have a battery of four Scotch boilers, serving our Plant, and we consider that we are getting most economical service. We prefer boilers of the internally fired type, believing that the heat in this way, is best utilized in the evaporation of water.

The percentage of loss in radiation, being reduced to a minimum.

Yours very truly,
(Signed) C. B. Orcutt,
President of Newport News Light and Water Co., also of Newport News Shipbuilding and Dry Dock Co.

Office of Engineer-in-Chief
Consolidated Gas Company of New York,
No. 4 Irving Place.

October 26th, 1895.

The Continental Iron Works,
Brooklyn (Greenpoint), N. Y.

Gentlemen:—Referring to the internally fired boilers that we are now using, I beg to say, that we put in the first pair in the year 1889, and were so well pleased with their performance that since that time in the course of alterations and repairs to our various plants we have introduced them and now have eleven in active service. I do not think they can be surpassed in either economy or efficiency, are set up or moved with ease, and not being encumbered with a mass of brick work can be at all times readily inspected and cared for when necessary. We have not as yet had occasion to spend a dollar on repairs on any one of them and we shall probably increase the number now in use in the near future.

Yours truly,
(Signed) W. H. Bradley,
Chief Engineer Consolidated Gas Co.

NEW YORK: 77 Liberty Street. **BOSTON:** 50 Oliver Street.

M. T. DAVIDSON,

Manufacturer of Improved Steam Pumps and Hydraulic Machinery,

Principal Office and Works: 43-53 Keap Street.

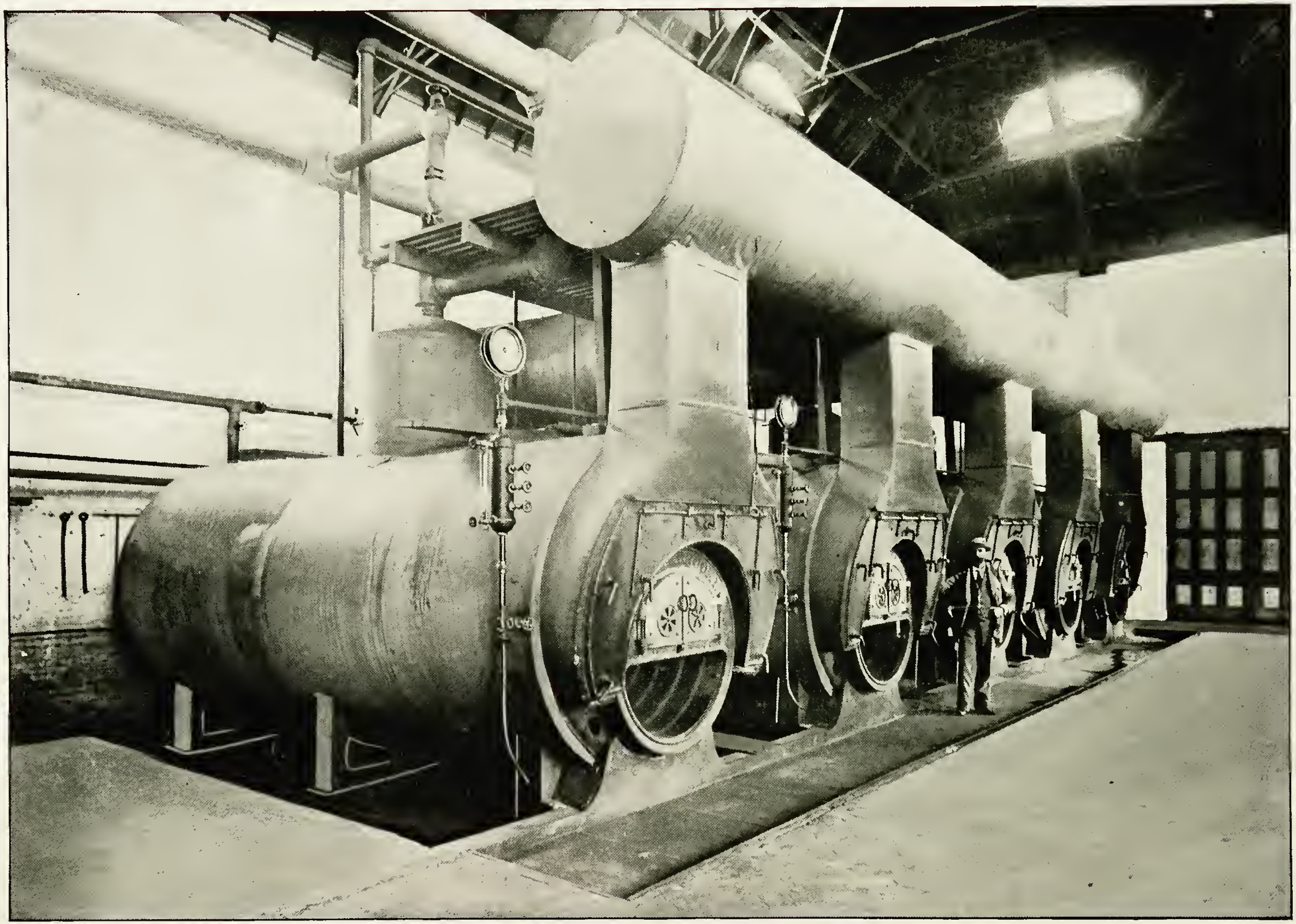
Brooklyn, Sept. 26, 1895.

The Continental Iron Works,
Brooklyn (Greenpoint), N. Y.

Gentlemen: Replying to your inquiry in reference to the efficiency of the ten internal furnace boilers recently furnished by me, in connection with my contract to install pumping engines at the "Milburn Station," of the Brooklyn Water Works, I have respectfully to say. There are two batteries, consisting of five boilers each, and they have given the best satisfaction. Five of them have been in almost constant use for four years, the other five have been in use for about two years, and none of them have cost anything for repairs during these respective periods. So entirely satisfactory has been my experience with the type of boilers which I furnished and caused to be erected at the pumping station above alluded to, that I could not be induced (of my own volition) to use, or recommend to others, any type of boiler not possessing the characteristics of the internal furnace boilers at "Milburn Pumping Station," for this type completely dispenses with carefully prepared foundations and the ordinary surrounding walls of brick. The iron furnace front, the buckstays, tie-rods, etc., all of which are necessary to the setting of stationary boilers with external furnaces, and which are adjuncts constantly liable to become disarranged, thereby involving much inconvenience and loss, creating large expenses in frequent repairs. In this latter type of boiler the mass of brick work so closely surrounds the sides and top of the cylindrical portion as to preclude perfect inspection, and causing difficulty in the making of repairs. Whereas the Internal Furnace type of boiler can be critically examined and repaired (if occasion requires) with the utmost facility.

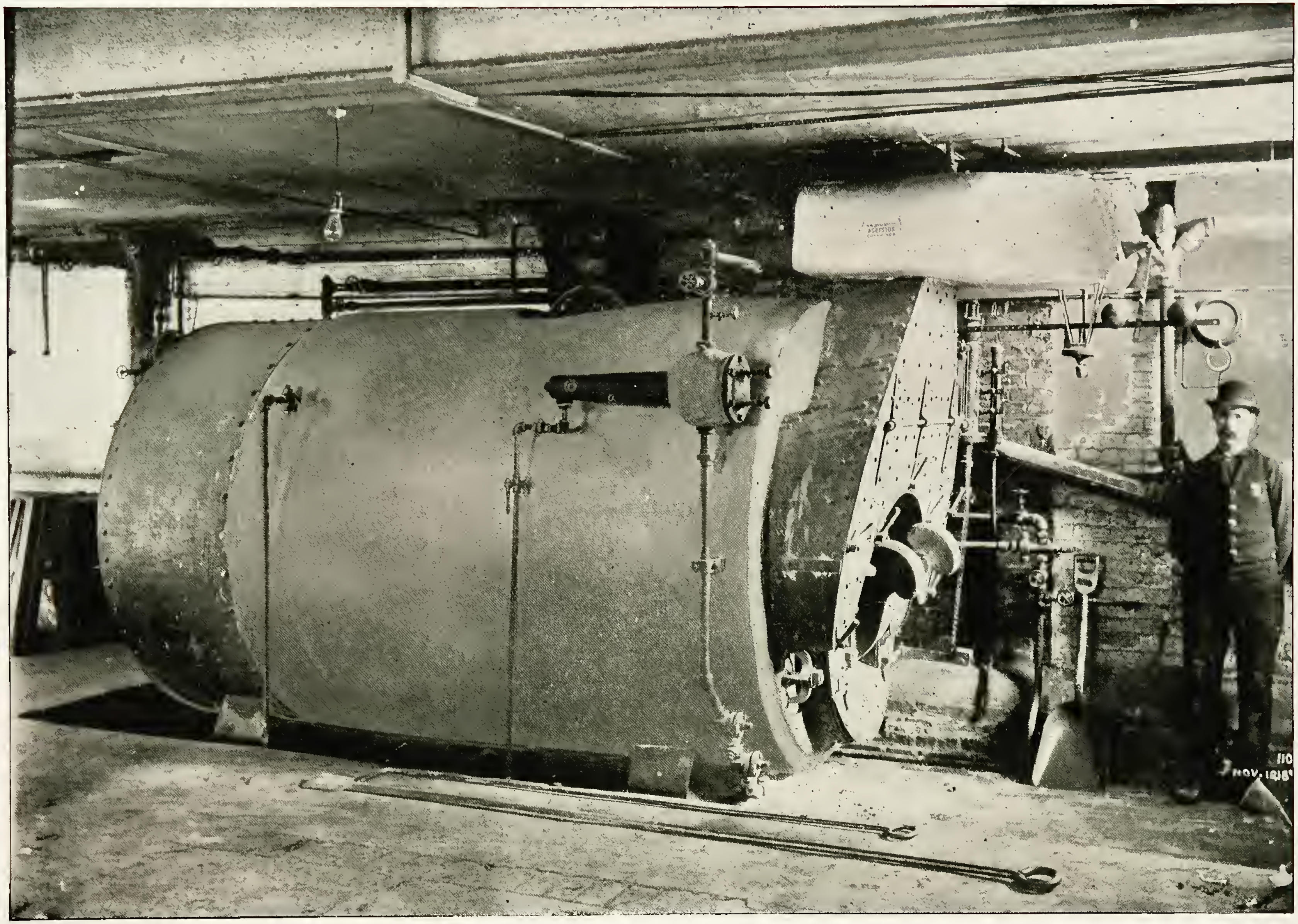
Again, referring to the boilers and pumping engines at the "Milburn Pumping Station," I am pleased to say that while working under the very low head of 52 feet maximum, and delivering nearly 40,000,000 gallons of water, per day of twenty-four hours, the engines developed an economic duty of 92,000,000 pounds feet for each 100 pounds of coal consumed, evidencing an evaporation of at least ten pounds of water for every pound of coal supplied to the furnaces. A result, very much better than I have before known to be accomplished by the use of any other type of boiler, and I have had much experience, as there are over four hundred boilers in the United States, which I have built and placed in service.

Very truly yours,
(Signed) M. T. Davidson.



BATTERY OF INTERNAL FURNACE BOILERS, MILBURN PUMPING STATION.

BROOKLYN WATER WORKS LOCATED AT MILBURN, LONG ISLAND N. Y.



INTERNAL FURNACE BOILER FOR HEATING PURPOSES.
LOCATED IN CELLAR OF OFFICE BUILDING.

TESTIMONIALS.

Office of the Port Richmond Iron Works,

I. P. MORRIS CO.

Charles H. Cramp, Pres. Henry W. Cramp, Treas.
William P. Thomas, Secy.

PHILADELPHIA, October 15, 1895.

THE CONTINENTAL IRON WORKS,
Brooklyn, N. Y.

GENTLEMEN: In reply to your verbal inquiry of our Mr. Hand in relation to the advantages of the internally fired type of boilers over those of the externally fired type, set in brick work, without going at any length into the subject, we beg to say that after ten years' experience in the building of internally fired boilers we have no hesitation in recommending them as the very best boilers for both power and industrial plants.

The particular design of this type that we have adopted for stationary use is the furnace-flue tubular boiler, which is a modification of the Scotch and Lancashire boilers, combining the best features of these two types.

The advantages of this type of boiler over those of the externally fired type are many and may be mentioned in the order of their importance: First: As to efficiency; ignition and combustion of the fuel taking place in furnaces and chambers surrounded by water the heat evolved is utilized in evaporating water, while in externally fired boilers much of the heat is lost in radiation through the outside walls of the furnaces and setting.

This in itself is an important item, and the efficiency of the two types is about in the proportion of 62% and 65% to 70% and 75%. Second: As regards space occupied; with a given space, all conditions being the same, the internal furnace tubular boiler will have about 40% additional capacity. This particularly recommends it for adoption in power plants where space is a great factor. The cost of maintenance is practically nothing, as there are no brick walls to repair, no brick furnaces to re-line, and the boiler itself is so constructed that it may be thoroughly examined inside and out, so that a complete inspection can be made and its exact condition ascertained at any time.

The boiler being self-contained is in a measure portable and this feature permits of its being moved at very little cost to accommodate the growth and enlargement of power stations.

These are a few of the many advantages which this type of boiler possesses, and we strongly urge its adoption in all modern steam plants.

We enclose you a copy of a letter from Mr. Andrew Shearer, Mechanical Engineer for Mr. John Wanamaker, of this city, in reference to the subject, and trusting this information will answer your purpose, we are,

Yours very truly,

(Signed) I. P. MORRIS CO.,

WM. P. THOMAS, *Secretary.*

JOHN WANAMAKER,

Mechanical Department.

PHILADELPHIA, May 9, 1894.

To whom it may concern:

On account of the numerous inquiries as to the workings of the improved type of double internally fired boilers in use by us, generally termed marine boilers by those who have had them in use, we have thought it advisable to prepare the following facts. In the spring of 1892 we had eleven boilers in use, four of them were water tube boilers. They had given us a great deal of trouble and were constantly out of repair. As a general thing it took the eleven boilers to supply us with enough steam to do our work. The four water tube boilers referred to were built under a guarantee to work up to 100 H. P. each. We took the four boilers out and introduced four boilers above referred to built by I. P. Morris Co., 8 ft. 6 in. in diameter, 26 ft. long.

We had them in working order in the fall of 1892, since which time they have given us no trouble whatever. We have added considerably to the amount of our machinery since that time, in the shape of one new Elevator, 1-800 Lt. Incandescent dynamo and 1-10 Lt. arc machine, and we consider, near as our record goes, we have burned 50 more arc lights daily since that time, and we find that with the four boilers and two return tubular boilers of 60 H. P. each, we can do all of our work with perfect ease, leaving our other five boilers laying idle. We are burning Buckwheat coal of a very poor grade, and our consumption of coal for the years 1890, '91, '92, '93, is as follows:

1890	5399 Tons.
1891	5289½ Tons.
1892	4819 Tons.
1893	4220½ Tons.

Considerable allowance should be made for the coal consumed during 1892, because during the change of boilers we reduced our number of lights and machinery to the lowest possible point.

We are at present working these boilers in bank, but we have disconnected them and worked them singly. They give us the same satisfaction either singly or together. We should be glad to have any one inspect the boilers as they are now placed, and we know from experience with a first class coal and a good draught they can be made to do more than is even claimed for them by their builders.

Respectfully,

(Signed) ANDREW SHEARER,

Master Mechanic for John Wanamaker.

TESTIMONIALS.

WILLIAM B. POLLOCK & COMPANY,

Steel and Iron Plate Work.

YOUNGSTOWN, OHIO, Nov. 11th, 1897.

THE CONTINENTAL IRON WORKS,
Brooklyn, N. Y.

GENTLEMEN:—Replying to your favor of the 9th, beg to say that the Furnaces furnished us in April, 1896, and to which you particulary refer, are in use in this city, at the Youngstown City Water Works. We are glad to say that the reports from the City Water Works are very encouraging; they simply say that the Boilers are most satisfactory. There have never been any repairs made nor, from present indications, are there likely to be for a number of years; they appear to be in as nice shape to-day as they were the first day they were filled with water for use. The reports have been confirmed by trustees and others connected with the Water Works at various times; just the other day one of the trustees stated that they were the most satisfactory boilers he has ever had to look after. The trustee mentioned is a Master Mechanic in one of our largest foundry and machine shops and, therefore, we set a great deal of value on his statements.

Yours truly,
(Signed) WILLIAM B. POLLOCK & Co.,
By PORTER POLLOCK.

C. W. Hunt,
W. F. Hunt,
C. C. King,
W. B. Page,
T. L. Marvel,
G. S. Humphrey.
"A. B. C." Code.

C. W. HUNT COMPANY,

45 Broadway, New York.

Cable Address, "Coalshovel."

December 26th, 1895.

THE CONTINENTAL IRON WORKS,
(Greenpoint) Brooklyn, N. Y.

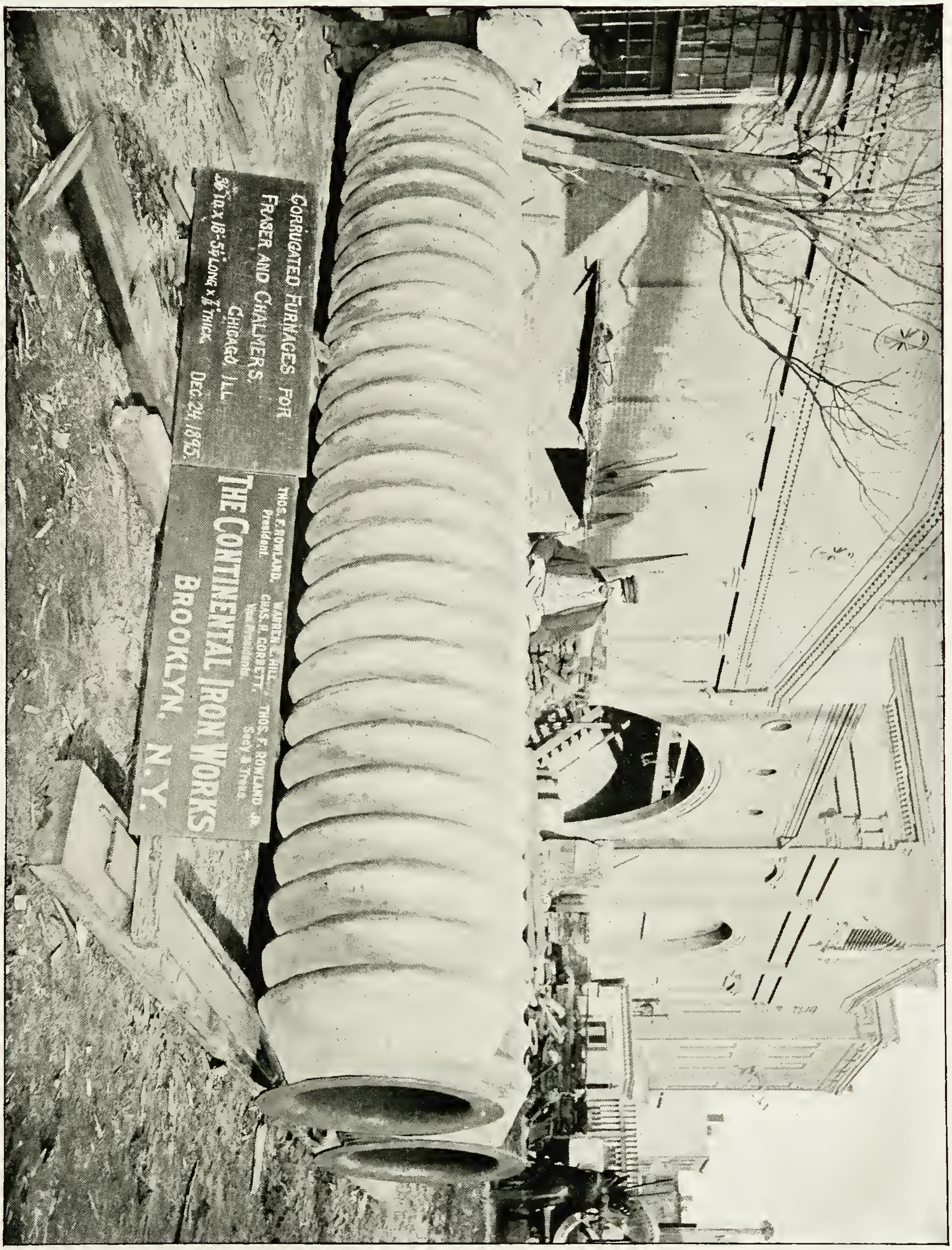
GENTLEMEN:—I have the pleasure of receiving your catalogue of internally fired boilers. We have used an internally fired boiler at our factory for ten years, with the highest satisfaction in every respect. During this time, it has furnished steam at 100 pounds pressure for ten hours in the day, and we have not, with the exception of renewing the grates, spent so much as one dollar on the boiler during this time, and a careful internal and external examination shows that the boiler is still practically as good as new. I trust that you may induce manufacturers generally to use this type of boiler.

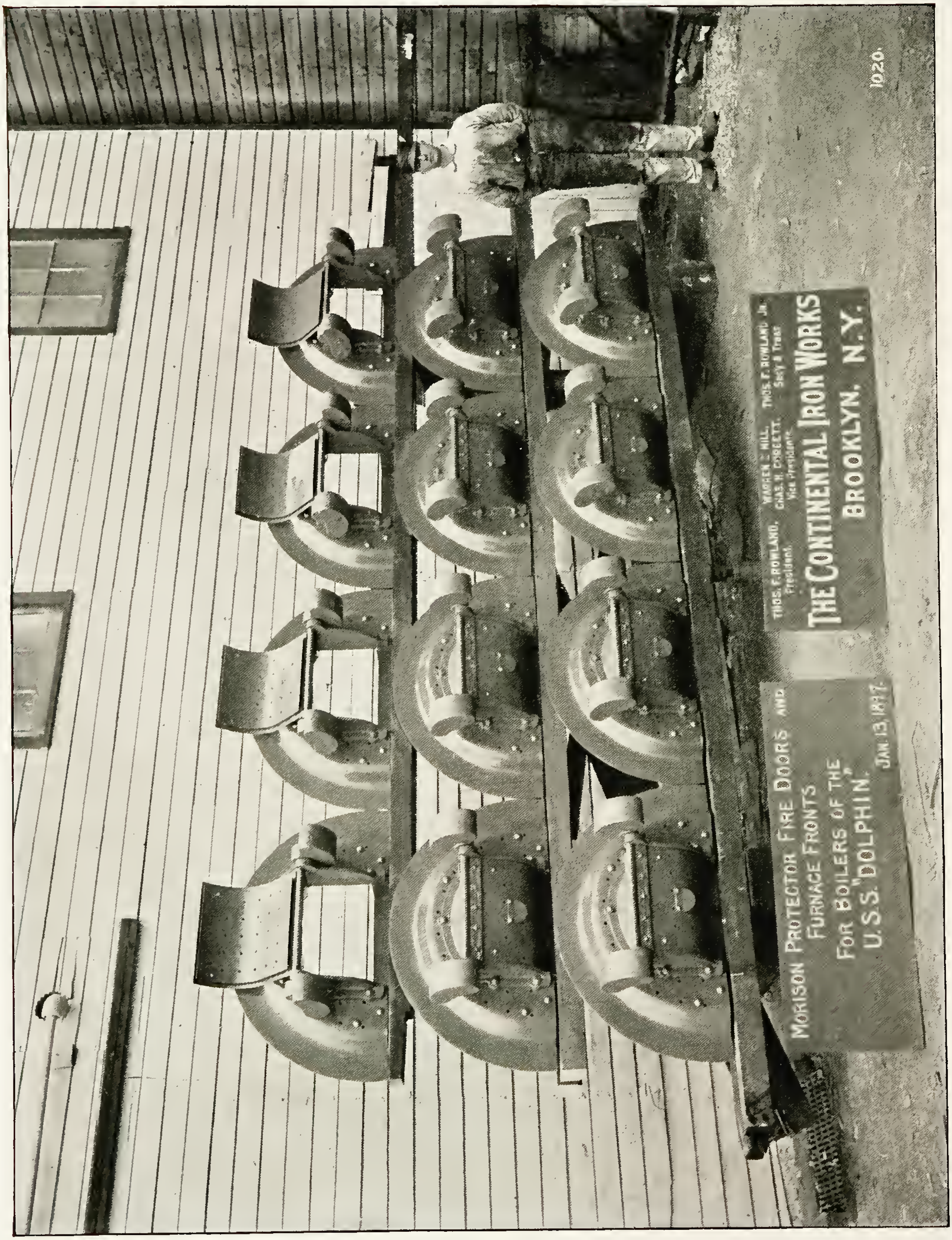
Yours truly,
(Signed) C. W. HUNT, President.

PARTIAL LIST OF INTERNAL FURNACE BOILERS, WITH CORRUGATED FURNACES OF THE CONTINENTAL IRON WORKS MANUFACTURE, USED IN OTHER THAN MARINE SERVICE.

THE BROOKLYN WATER WORKS	Brooklyn, N. Y.
PHILADELPHIA WATER WORKS	Philadelphia, Pa.
CHICAGO WATER WORKS	Chicago, Ill.
MINNEAPOLIS WATER WORKS	Minneapolis, Minn.
NEWPORT NEWS WATER WORKS	Newport News, Va.
DAVENPORT WATER WORKS	Davenport, Iowa.
AURORA WATER WORKS	Aurora, Ill.
YOUNGSTOWN WATER WORKS	Youngstown, Ohio.
THE BROOKLYN UNION GAS CO.	Brooklyn, N. Y.
METROPOLITAN GAS LIGHT CO.	Elizabeth, N. J.
CONSOLIDATED GAS CO.	New York City, N.Y.
DULUTH ELECTRIC LIGHT & POWER CO.	Duluth, Minn.
EDISON ELECTRIC LIGHT & POWER CO	La Crosse, Wis.
GALESBURGH ELECTRIC LIGHT CO.	Galesburgh, Ill.
NAPPANEE ELECTRIC LIGHT WORKS	Nappanee, Ind.
MASONIC TEMPLE	Chicago, Ill.
GREAT NORTHERN HOTEL	Chicago, Ill.
U. S. WAR DEPARTMENT	Fort Hancock, N. J.
THE ALDINE HOTEL	Philadelphia, Pa.
CARNEGIE LIBRARY	Pittsburgh, Pa.
NORTH HUDSON COUNTY RAILROAD	Weehawken, N. J.
MANHATTAN RAILWAY CO.	New York City, N.Y.
BERGNER BREWING CO.	Philadelphia, Pa.
THE ATLANTIC MILLS	Lawrence, Mass.
CALLENDER, MCAUSLAND & TROOP CO.	Providence, R. I.
STUDEBACKER BROS. COMPANY BLD'G	Chicago, Ill.
STAMFORD MFG. CO.	Lynchburg, Va.
FOX PRESSED STEEL CO.	Joliet, Ill.
PENNSYLVANIA BOILER WORKS	Erie, Pa.
JOHN WANAMAKER	Philadelphia, Pa.
C. J. MEISTER	Baltimore, Md.
A. BOOTH PACKING COMPANY	Astoria, Ore.
NORTH PACIFIC BREWERY	Astoria, Ore.
UNION FISHERMEN'S CO-OPERATIVE PACKING CO.,	

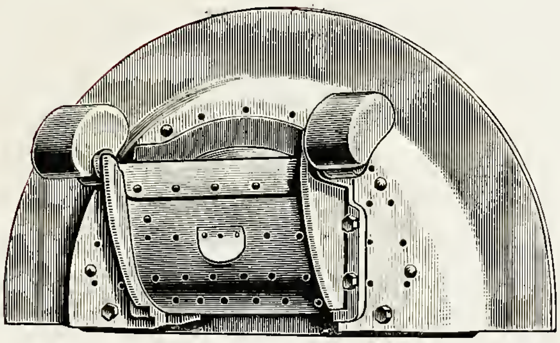
and many others.

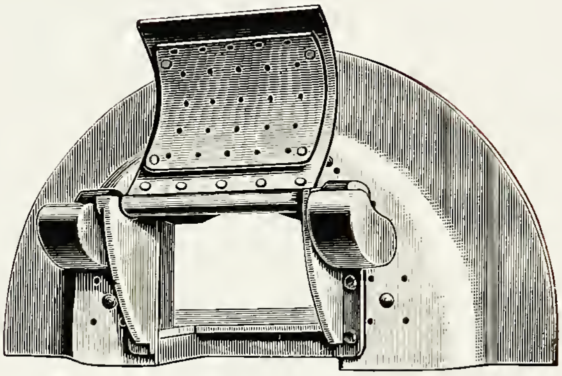

CORRUGATED FURNACES FOR
FRASER AND CHALMERS,
CHICAGO, ILL.
DEC 24, 1895.
THOS. F. ROWLAND, President.
THE CONTINENTAL IRON WORKS
BROOKLYN, N.Y.


MORISON PROTECTOR FIRE DOORS AND
FURNACE FRONTS
FOR BOILERS OF THE
U.S.S. "DOLPHIN."
JAN 13 1897
THOS. F. ROWLAND, President.
WARREN E. HILL, CHAS. H. CORBETT, Vice Presidents.
THOS. F. ROWLAND, JR. Sec'y & Treas.
THE CONTINENTAL IRON WORKS
BROOKLYN, N.Y.
1020.

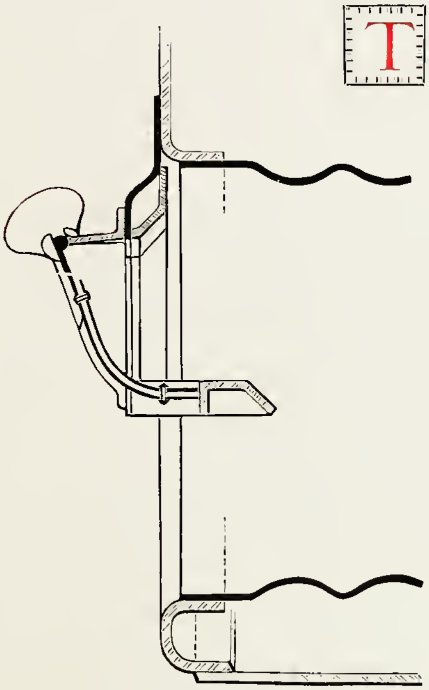
Morison Patent Furnace Front and Door

FOR INTERNAL FURNACE BOILERS.





Unequaled for Economical and Rapid Firing.
Prevents the Destruction of Baffle Plates.



THE MORISON PATENT FURNACE FRONT AND DOOR is intended to overcome some of the defects which are inherent in the present type of furnace doors in use on marine and land boilers. The primary object is to prevent the undue accumulation of fuel on the front end of the grate which causes overheating and ultimate destruction of the furnace door and its attachments, and in consequence of the freedom from obstruction in the front end of the furnace, much better facilities are afforded for properly stoking the fire. To accomplish this, a portion of the dead plate immediately inside of the furnace door is left out, so as to leave a recess. The door is provided with an inward extension, which, when the door is closed, fills the recess in the dead plate. This extension, also the vertical portion of the door, may be perforated and provided with a perforated baffle plate.

THE FURNACE FRONT is made of a plate of pressed steel, worked to the shape indicated in the illustrations and protected from the fire by perforated cast iron liners.

THE FURNACE DOOR is arranged to open upward and is so counterweighted as to remain open while the furnace is being stoked. This is a very important feature in a marine boiler, as it does away with catches or other devices for preventing the door from closing with the motion of the ship.

ANOTHER VALUABLE FEATURE of the Morison Patent Furnace Door is, that in consequence of the fire being removed from the immediate front of the furnace, the fire room is much cooler, which allows the men to work with more comfort than when the ordinary form of door is used.

THESE FRONTS and DOORS are made of several sizes to suit different size furnaces.

MORISON PATENT FURNACE FRONTS AND DOORS ARE IN USE BY: The British Admiralty, Japanese Navy, U. S. Navy Department, U. S. War Department, U. S. Quartermaster's Department, U. S. Government Printing Office, Cornell Steamboat Company, Rondout, N. Y.; East Boston Ferry Company, Boston, Mass.; Brooklyn Water Works, Ridgewood Station; Consolidated Gas Company, New York; Fox Pressed Steel Company, Joliet, Ill.; Stamford Mfg. Company, Lynchburg, Va.; Callender, McAuslin & Troop Company, Providence, R. I.; Great Northern Hotel, Chicago, Ill.; New York, New Haven & Hartford Railroad Co., and many others.

FOR PRICES and OTHER INFORMATION, address,

THE CONTINENTAL IRON WORKS,

Sole Manufacturers in the United States. NEW YORK (BOROUGH OF BROOKLYN).